



# EXPERIMENT STATION RECORD.

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## EXPERIMENT STATION RECORD.

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The fifth session of the Graduate School of Agriculture was held at the Michigan Agricultural College, East Lansing, Mich., July 1 to 26. As heretofore, the school was under the general management of the Association of American Agricultural Colleges and Experiment Stations, through its standing committee on graduate study. The financial support of the school was derived from the contributions of many of the colleges represented in the association, the matriculation fees of the students, and the funds of the Michigan Agricultural College. This institution, through its president and trustees, generously assumed responsibility for the maintenance of the school. President Snyder, Secretary Brown, Dean Shaw, and other members of the faculty made the local arrangements for the sessions and otherwise contributed in many ways to its success. The lectures and seminars were largely held in the great Agricultural Building, admirably adapted for the purpose, but the Bacteriological and Entomological buildings were also used. The lecturers were very pleasantly housed in the spacious Woman's Building, where Dean Gilchrist and her associates in the home economics department did much to make their stay at the college very agreeable; other buildings, libraries, and other equipment of the college were placed at the disposal of the school. The extensive field experiments, the botanic garden, and the many varieties of trees on the beautiful campus furnished much of interest for observation. Dr. A. C. True, Director of the Office of Experiment Stations, served as dean, as at the previous sessions, and Secretary A. M. Brown, of the Michigan College, acted as registrar.

Courses of study were offered in the following lines: Soils and plant physiology, animal physiology, agronomy, horticulture, beef and dairy cattle, swine and poultry, rural engineering, and rural economics, including farm management. As at previous sessions, the hours were so arranged that all interested in plants could attend the course in soils and plant physiology, and those interested in animals the course in animal physiology, and these courses dealt more particularly with fundamental topics considered from the standpoint

of both pure and applied science. The other courses were so arranged that the students naturally divided into smaller groups along the lines of their chief special interests.

The faculty numbered forty-eight, in addition to six speakers at special conferences on general questions relating to agricultural education and research. It included seven officers of the U. S. Department of Agriculture, fifteen members of the faculty of the Michigan Agricultural College, and eighteen professors and experts from fourteen other agricultural colleges and experiment stations. In addition, lecture courses and seminars were given by Dr. T. N. Carver, professor of economics of Harvard University; Dr. H. C. Sherman, professor of food chemistry, Columbia University; Dr. L. B. Mendel, professor of physiological chemistry, Yale University; Dr. Oscar Riddle, research associate of the Carnegie Institution of Washington; and H. N. Ogden, professor of sanitary engineering, Cornell University.

Many interesting and valuable matters were also brought out from an international viewpoint in the lectures given by Dr. E. J. Russell, Director of the Rothamsted Experiment Station, England; Dr. F. H. A. Marshall, professor of agricultural physiology, Cambridge University, England; and Dr. Oscar Loew, of the Hygienic Institute, Munich, Germany.

The total enrollment of students at the close of the session was one hundred and eighty, including forty-one women who were also enrolled in the Graduate School of Home Economics. This latter school was under the general management of the American Home Economics Association, and for the first time prolonged its session to cover four weeks. As heretofore it was conducted in close affiliation with the Graduate School of Agriculture. The students in both schools came from thirty-four States and Porto Rico, Canada, Russia, China, and Japan.

The public opening exercises were held on the evening of July 3 in the auditorium of the Agricultural Building of the college, and were well attended. Dr. H. P. Armsby, chairman of the committee on graduate study of the association, presided and made an introductory address. An address of welcome was made by President Snyder on behalf of the Michigan Agricultural College. Dean R. S. Shaw, of the agricultural division of this college, spoke on the leading features of Michigan agriculture. Dean Maude Gilchrist, of the home economics division, spoke on the work of the Graduate School of Home Economics. Dean True, of the Graduate School of Agriculture, gave a brief summary of the history of the school during the decade of its existence, and pointed out in a general way the development of American agriculture and agricultural education and research during that period. The substance of his remarks on the latter topic are as follows:

The main objects of the school have been to arouse interest in graduate study and to stimulate a keener sense of the needs and requirements of such work by bringing graduate students for a brief time under the direct influence and inspiration of leading teachers and investigators in different branches of agricultural and related sciences. There can be no doubt that this school has exerted considerable influence in promoting the establishment of graduate courses in agriculture in a number of institutions. It is also believed that it has done much toward creating more favorable conditions for serious study and research along agricultural lines in our whole system of agricultural colleges and experiment stations. And through its conferences on pedagogical and other questions relating to the broader aspects of agricultural education it has aided in the wider diffusion of agricultural knowledge through the lower schools and extension agencies.

In the decade during which the Graduate School of Agriculture has been in operation the movement for agricultural education in the United States has been greatly broadened and strengthened. Comparing very briefly the statistics of 1901 with those of 1911 (the latest available), we may get some indication of the growth of our agricultural institutions during this period. The permanent funds and equipment of the land-grant colleges have increased from \$67,000,000 to \$120,000,000 and their income from \$7,000,000 to \$22,000,000. The total number of students has increased from 42,000 to 84,000, and of agricultural students from 7,000 to 16,000.

In 1901, 2,000 farmers' institutes were held in the United States, with an attendance of 500,000; in 1911 there were 6,000 institutes, with an attendance of 2,500,000, to which may be added 1,000,000 persons who attended the lectures given in connection with special railroad trains and other forms of extension work.

Meanwhile there has been a remarkably rapid introduction of agriculture into the secondary schools. Within the past two years the number of institutions of secondary grade giving courses in agriculture has risen from 700 to 2,300.

Within the past ten years experimental and research work in agricultural lines has also greatly increased. In 1901 the experiment stations had an income of \$1,232,000, as compared with \$3,615,000 in 1911; and the membership of their staffs increased from 688 to 1,587. In the middle of this period the Adams Act was passed, which has already done very much to set in operation higher researches on agricultural problems.

It is interesting to note the increase in some lines of research—the number of chemists increasing from 146 to 293; botanists from 49 to 84; mycologists and bacteriologists from 21 to 60; entomologists from 48 to 108; horticulturists from 78 to 131; animal husbandmen

from 14 to 101; and dairymen from 31 to 77. Great advances in specialization is also shown in the following, who did not appear at all in the 1901 statistics of the stations but were given in 1911: Agronomists 139; plant breeders 12; soil specialists 34; plant pathologists 54; foresters 22; poultrymen 32; and agricultural engineers 21.

Meanwhile the financial interests involved in American agriculture have grown enormously. Land values have more than doubled and aggregate nearly thirty billions of dollars; total values of farm property have also doubled and aggregate over forty billions of dollars. The total value of the agricultural products of the United States for the twelve years ending in 1910 was seventy-nine billions of dollars.

The number of our farms has increased only ten and five-tenths per cent, but they aggregate 6,340,000; the farm population has increased very slowly, but there are thirty million people on our farms.

We are just awakening to the vast significance of the human and material problems involved in the development of our agriculture. Attention is just now focused on the rapid spread of the movement for popular education in agriculture. But those who stand closest to this great movement and realize most fully what it means, know also that there never was a time when wise leadership and sound and deep knowledge in agricultural matters were so much to be desired as to-day. The period of propaganda to convince the rural people of the desirability of agricultural education and research is nearly over. What is especially needed now is wise and well-educated leadership in order that the great movement under way may be efficiently organized and guided in right channels. Thoroughly trained investigators, teachers, and administrators are needed in constantly increasing numbers, and the supply is far below the demand. The importance of such conferences along the higher ranges of agricultural work as this Graduate School is greater than ever before and we ought to pursue our work here with the greatest enthusiasm and seriousness, in the hope that our meeting together will help to strengthen the forces which are seeking to guide public sentiment in right channels of thought and activity for agricultural advancement and to disseminate useful and sound knowledge on agricultural subjects among great numbers of students in our agricultural institutions and among the masses of our rural people throughout the United States.

The courses in soils and plant pathology, animal physiology, and rural economics, including farm management, were very strong and attractive. The problems of the soil were discussed in their physical, chemical, and biological aspects and from many points of view. Dr. Schreiner, of the Bureau of Soils, discussed the organic soil

constituents and their effect on plant growth, and summarized his own recent investigations on the biochemistry of soils. Professor Patten, of the Michigan Agricultural College, presented the chemical status of soil phosphorus, and his associate, Mr. Robinson, discussed the chemistry of humus. Dr. Headden, of the Colorado Agricultural College, described the peculiar characteristics of Colorado soils and gave the results of his investigations on the problems of alkali and nitrates in those soils; Dr. E. J. Russell treated the production of plant food in the soil, with special reference to the Rothamsted investigations on the effect of partial sterilization on the soil organisms. Professor Jeffery, of the Michigan College, discussed various factors affecting the functioning of soils, and his associate, Dr. Bouyoucos, showed the radiating power of soils under various conditions. Dr. Bizzell, of Cornell University, presented some of the results of investigations by Dr. Lyon and himself on the problems of nitrification and the colloidal matter in soils; Dr. Duggar, of the same institution, dealt with the rôles of mineral nutrients in plant metabolism and the fixation of nitrogen by soil organisms. Dr. Oscar Loew, of the Hygienic Institute, Munich, Germany, discussed the rôle of mineral nutrients in animals and plants, especially in regard to lime and magnesia.

In the course in animal physiology, Dr. Mendel discussed some of the problems in the biochemistry of nutrition, and summarized the newer researches on nutrition in growth and maintenance; Dr. Sherman treated the functions of food and of the digestive ferments and the utilization of specific food materials; and Dr. Forbes, of the Ohio Experiment Station, dealt with the mineral elements in animal nutrition. Dr. C. E. Marshall, of the Michigan Agricultural College, and his associates, Messrs. Brown, Giltner, Rahn, and Van Suchtelen, discussed the biology of the cell. Dr. Riddle's lecture had to do with the phenomena of development, with special reference to color characters and the physiological basis of sex. The significance and origin of sex differentiation and the inheritance of sex were discussed by Dr. Pearl, of the Maine Experiment Station. Mr. Morse, of this Office, dwelt especially on the importance of the application of physiological methods to live stock investigations and instruction.

In rural economics, Dr. Carver laid special stress on the economizing of human energy and of land in the rural industries, and the general problems connected with the maintenance of the efficiency of the rural population. Mr. Galpin, of Wisconsin University, emphasized the social factors of the rural community; Dr. Hedrick, of the Michigan College, spoke on human ecology; Dr. Warren, of Cornell University, described the methods of making agricultural



surveys, and gave many interesting illustrations drawn from his work in New York with reference to the size and character of farms as related to their productiveness and financial returns. Messrs. C. B. Smith and E. H. Thomson, of the Farm Management Division of the Bureau of Plant Industry, described the methods pursued in farm management field studies and demonstrations, and discussed farm organization and labor and the factors affecting profits in farming in the corn belt.

In the course in rural engineering, lectures were given on drainage by Professor Stewart of Minnesota, roads by Dr. Hewes of the Office of Public Roads, irrigation in humid regions by Mr. Williams of this Office, rural sanitation by Professor Ogden of Cornell University, and farm mechanics by Professor Davidson of Iowa State College. During the last week of this course important conferences on the scope and methods of instruction in rural engineering in the agricultural colleges were held by a number of the heads of such departments in different institutions.

Eight interesting conferences on the principles of general and agricultural research, the scope, aim, and methods of college and secondary instruction in agriculture and of extension work along this line were held under the leadership of Dean Hunt of Pennsylvania State College, Professor Coulter of the University of Chicago, Dean Russell of the Wisconsin College of Agriculture, Professor Tuck of the New York State College of Agriculture, Professor Christie of Purdue University, Professor French of Michigan Agricultural College, and Dean True.

Meetings of the International Association of Poultry Instructors and Investigators, the Association of Official Dairy Instructors, and the American Society of Agronomy were held before or during the session of the Graduate School of Agriculture, as well as the annual conclave of the Alpha Zeta Fraternity. Excursions were made to peppermint and other farms in the vicinity of Lansing. Receptions to the school were given by President and Mrs. Snyder at their home, and by Dean Gilchrist at the Woman's Building.

Much high-grade work was done at this session of the Graduate School of Agriculture, and the discussions covered a wide range. It is believed that the three hundred persons who came in contact with this school as lecturers, students, or visitors gave and received much of value as inspiration to better teaching and investigating, and that the results of this session will be widely felt in our agricultural institutions.

## RECENT WORK IN AGRICULTURAL SCIENCE.

### AGRICULTURAL CHEMISTRY—AGROTECHNY.

**Handbook of biochemical methods**, edited by E. ARDERHALDEN (*Handbuch der Biochemischen Arbeitsmethoden*. Berlin and Vienna, 1912, vol. 5, pt. 2, pp. XV+673-1467, pl. 1, figs. 139).—This portion of the work deals with the detection of poisons by chemical methods, the transplantation of tissues, the technique of cultivating tissues in vitro, methods for the biochemical examination of the soil, methods for metabolism tests with micro-organisms, the gasometric determination of primary aliphatic amino-nitrogen and its use for physiological-chemical investigations, the analysis of proteins for determining the characteristic groups of various amino acids, the Zuntz method of gas analysis, new apparatus for metabolism experiments, ash analysis, ultra-filtration, tables for the preparation of solutions with definite hydrogen ion concentrations, methods for biological micro-analysis, methods for studying intermediary metabolism, methods for the biochemical study of plants, quantitative micro-elementary analysis of organic substances, capillary analysis, biochemical and chemotherapeutic methods for trypanosomes, and reagents for detecting the more important biological compounds.

**An introduction to the chemistry of colloids**, V. POSCHL, trans. by H. H. HODGSON (London, 1910, pp. 114).—An English edition of the German work previously noted (E. S. R., 24, p. 120).

**Introduction to colloid chemistry**, V. POSCHL (*Einführung in die Kolloidchemie*. Dresden, 1911, 3. ed. rev., pp. 89).—A third edition of the work above referred to.

**Physical chemistry of the cell and tissue**, R. HÖBER (*Physikalische Chemie der Zelle und der Gewebe*. Leipzig, 1911, 3. ed., pp. XV+671, figs. 55; rev. in *Biol. Centbl.*, 32 (1912), No. 4, pp. 243-250).—A third revised and enlarged edition of this work on physical chemistry as applied to physiological problems.

**Chemistry of the cell**, W. J. GIES ET AL. (*Biochem. Bul.*, 1 (1911), No. 1, pp. 65-93).—These are abstracts of communications to a symposium on the chemistry of the cell, held at Columbia University, including intracellular water, salins, carbohydrates, lipins, proteins, extractives, and enzymes, and factors in immunity.

**In regard to the chemistry of chlorophyll**, M. S. TSVETT (*Rev. Gén. Sci.*, 23 (1912), No. 4, pp. 141-148).—This article gives a general view of the present status of the chemistry of chlorophyll.

**Yearbook of chemistry**, edited by R. MEYER (*Jahrb. Chem.*, 20 (1910), pp. XII+568).—This is a report of the more important progress made in the field of pure and applied chemistry for the year 1910.

**Investigations in regard to the precipitation of proteins**, A. J. J. VANDELDE (*Bul. Soc. Chim. Belg.*, 25 (1911), No. 4, pp. 166-173).—Continuing previous work (E. S. R., 25, p. 709), the author now reports further results of

experiments in precipitating fractionally by various methods proteins from cow's milk, colostrum, equine and bovine serum, and hen's eggs. Some proteins were redissolved and precipitated.

The results bring out the fact that the transformation of one protein into another is not uncommon, and furthermore that the transformations which do occur include changes in regard to their precipitation with reagents and temperature of coagulation.

The synthesis of fats by the action of enzymes, F. L. DUNLAP and L. O. GILBERT (*Jour. Amer. Chem. Soc.*, 33 (1911), No. 11, pp. 1787-1791).—Previously noted from another source (*E. S. R.*, 28, p. 307).

The variations in the phosphorus content of seeds under varying vegetative conditions, MILE S. LEWONIEWSKA (*Bul. Internat. Acad. Sci. Cracovie. Cl. Sci. Math. et Nat.*, Ser. B, 1911, No. 2, pp. 85-96).—The variation in the total phosphorus and nitrogen content of oat seeds was found to be due chiefly to the vegetative conditions, and the variety of seed employed had practically no relation to these constituents. The greatest variation was in the case of the phosphorus compounds soluble in 1 per cent acetic acid solution, namely, inorganic phosphorus and phytin, with little variation for protein and lecithin phosphorus.

Plants which received a goodly supply of phosphorus showed 2, 3, and 4 times more inorganic and phytin phosphorus than those which received phosphorus sparingly. From this it follows that plants receiving scant amounts of phosphorus will yield seeds which have appropriated much of the phosphorus for the production of nuclein compounds, while those plants having a good supply of phosphorus to draw upon will show a larger storage of phosphorus as inorganic combinations and phytin in the mature seed. The variation in the nitrogen content of the seeds was far greater than that of the phosphorus, and the protein nitrogen showed a greater fluctuation than the nonprotein nitrogen. The reason for this variation was not apparent to the author. It is believed that by determining in the seed the phosphorus soluble in 1 per cent acetic acid a better index can be obtained as to the assimilable phosphorus in the soil than by determining the nitrogen-phosphorus ratio of the seed.

In regard to the action of phosphates upon the activity of proteolytic ferments, N. N. IWANOW (*Trudy Imp. S. Peterb. Obshch. Estestvo. (Trav. Soc. Imp. Nat. St. Petersb.)*, 42 (1911), III, No. 2-8, pp. 225-238).—It was found that potassium acid phosphate ( $\text{KH}_2\text{PO}_4$ ) accelerates the autolysis of proteins in yeast extract (hefanol). This activity was found to increase to a certain point when the phosphate content was increased (from 0.38 to 1.52 per cent), and was dependent upon the temperature and the amount of protein present, but independent of a preexisting fermentation of saccharose. In all instances it was found that no total solution of the protein took place, and only 16 per cent dissolved when 1.52 per cent of phosphate was present. In water, as well as in a 5 per cent saccharose solution, the cleavage was accelerated by neutral phosphates at various temperatures, but the action was retarded by alkaline phosphates ( $\text{K}_2\text{HPO}_4$ ).

Some observations upon the assay of digestive ferments, H. T. GRABER (*Jour. Indus. and Engin. Chem.*, 3 (1911), No. 12, pp. 919-921).—The results show "that the composition of the white of the egg, chemically and probably even physically, when used for the assay of pepsin, has a great bearing upon the apparent strength of this ferment. The albumin seems to be more difficult to digest the first 24 hours after the egg is laid and a change gradually takes place until after about 5 to 7 days it has reached its maximum solvent condition. After this period its digestibility gradually diminishes.

"In the assay of pancreatin for starch hydrolysis, as well as all the diastasic ferments, the kind of starch used is of prime importance and in stating the strength of each it should be in terms of the particular starch employed."

In tests with papain it was found to make very little difference what kind of raw beef was used when the ferment was acting in acid media, but if the nature of the Beef was changed (for instance, by cooking) papain was found to lose its solvent action. Rennet was found to be influenced in its coagulating power by the chemical composition of the milk as regards the presence and amount of inorganic salts, particularly calcium salts. The mixing of the rennet with the milk, the temperature at which the milk was kept before and during the test, and finally the breed of cows from which the milk was obtained were additional factors.

Action of the salts of the gold group upon the saccharification of starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris]*, 70 (1911), No. 13, pp. 547-553).—This is a continuation of the studies previously noted (E. S. R., 25, p. 107) with the salts of this group as to the hydrolysis of starch. Zinc chlorid acidulated with hydrochloric acid, potassium oxalate acidulated with oxalic acid, copper chlorid, and the various chlorids of gold and platinum were employed. Some tests upon the coagulation of milk with these chemicals are also included.

Action of the salts of the alkali metals upon the saccharification of starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris]*, 70 (1911), No. 10, pp. 391-397).—The author reports his results with the salts from inorganic, monobasic acids (chlorids, nitrates, and fluorids of sodium, potassium, and ammonium), the salts of dibasic acids (sodium sulphate and bisulphate), and those from tribasic acids (tri-, di-, and monopotassium orthophosphates). Experiments were also made with the organic salts of monobasic organic acids from the aliphatic and aromatic series (sodium formate, acetate, butyrate, propionate, valerate, stearate, palmitate, benzoate, and salicylate), and salts of the polybasic acids (potassium and sodium oxalate and citrate).

Action of some salts upon the saccharification of Fernbach and Wolff's soluble starch by amylolytic ferments, C. GERBER (*Compt. Rend. Soc. Biol. [Paris]*, 71 (1911), No. 27, pp. 247-249).—This work was done with the chlorids of cadmium, bichlorid of mercury, zinc chlorid, cupric chlorid, silver nitrate, potassium oxalate, sodium citrate, and quinin hydrochlorate.

In regard to catalase, GRIMMER (*Milchw. Zentbl.*, 7 (1911), No. 7, pp. 314-316).—A discussion in regard to the findings of W. D. Kooper (E. S. R., 28, p. 112) with the various forms of apparatus for determining the catalytic activity of milk.

The examination of substances important in agriculture and the industries, J. KÖNIG (*Die Untersuchung landwirtschaftlich und gewerblich wichtiger Stoffe. Berlin*, 1911, 4. ed. rev., pp. XX+1226, figs. 426).—This is the fourth edition of this work (E. S. R., 17, p. 1133).

A quantitative method for determining small amounts of potassium, E. A. MITSCHERLICH, K. CELICHOWSKI, and H. FISCHER (*Landw. Vers. Stat.*, 76 (1912), No. 1-2, pp. 139-155).—The method which follows is recommended for determining small amounts of potassium in soil extracts which are obtained by extracting soil with water, saturated with carbon dioxide, and any other material containing potassium.

To 250 cc. of the soil solution in a beaker, 5 cc. of concentrated nitric acid and 5 drops of dilute (1:3) sulphuric acid are added, and the whole concentrated to a bulk of 20 cc. The concentrated solution is transferred quantitatively to a platinum or quartz dish, evaporated to dryness, and the organic matter destroyed by heating the dish for a short time.

The residue is taken up with 1 drop of a concentrated sodium carbonate solution, free from potassium, and a few cubic centimeters of warm water. The solution is evaporated and the residue heated until fusion of the sodium carbonate has taken place. The cooled residue is approximately neutralized with nitric acid, and any free acid which remains must be removed by evaporation. The residue from this is then dissolved in about 5 cc. of hot water and treated with 3 cc. of a 10 per cent cobalt chloride solution and about 5 cc. of a 10 per cent sodium nitrite solution. After this the solution is evaporated to dryness slowly (shaking occasionally during the process to avoid crust formation) at a temperature of from 80 to 90° C., and when cooled 3 cc. of a 10 per cent acetic acid is added to dissolve the excess of sodium cobaltic nitrite.

On solution of the crust 10 cc. of water is added, and the crystalline residue which remains is transferred to a Gooch crucible which holds a disc of hardened filter paper. The precipitate on the filter is washed with small amounts of a 2½ per cent solution of sodium sulphate. To the crucible and washed residue contained in a beaker about 20 cc. of fiftieth-normal potassium permanganate and 100 cc. of water are added, and the beaker and its contents is placed in a water bath, the temperature of which is then gradually raised to the boiling point. The beaker is shaken occasionally during the interim. If manganese superoxide separates out, 25 cc. of dilute sulphuric acid is added drop-wise. When the yellow precipitate on the filter has dissolved the beaker is removed from the water bath and an excess of fiftieth-normal oxalic acid solution is added, and the excess of oxalic acid is titrated with fiftieth-normal potassium permanganate solution (1 cc.=0.0001571 gm. of potassium oxid).

This method can also be used for examining material containing large quantities of potassium.

An improved Hollemann method for estimating phosphoric acid, E. VITORIA (*Chem. Ztg.*, 35 (1911), No. 123, p. 1152; *abs. in Analyst*, 36 (1911), No. 429, p. 605).—"When a superphosphate is boiled for a few hours in a cold saturated solution of ammonium nitrate, almost the whole of the phosphoric acid goes into solution. About 2 gm. of the superphosphate, finely ground and dried at 115 to 120° C., are vigorously boiled for about 10 hours with 100 to 150 cc. of ammonium nitrate solution, 10 cc. of sodium acetate solution, and 500 cc. of water; the water lost by evaporation is replaced from time to time, and the liquid is finally made up to 1 liter. Forty cc. of this solution are made slightly alkaline with sodium hydroxid and shaken with 20 cc. of tenth-normal silver nitrate solution; the silver phosphate is filtered off rapidly, and the excess of silver in the filtrate is titrated according to Volhard's method."

Neutral ammonium citrate solutions, A. J. PATTEN and C. S. ROBINSON (*Michigan Sta. Rpt.* 1911, pp. 173-178, figs. 2).—The work here reported has been previously noted (*E. S. R.*, 26, p. 98). See also an article by Hall (*E. S. R.*, 26, p. 109).

The use of Busch's "nitron" for the determination of nitrate nitrogen in soils and fertilizers, C. S. ROBINSON and O. B. WINTER (*Michigan Sta. Rpt.* 1911, pp. 178-181).—The authors conclude that "the 'nitron' method [*E. S. R.*, 16, p. 945] seems to be generally inapplicable to the determination of nitrate nitrogen in soils but can be used to advantage in the determination of this form of nitrogen in fertilizers. The reason for its failure in the case of soils is the presence of organic matter which either contaminates the precipitate or holds it up."

Practical hints for determining the hygroscopicity of soils by the Bode-wald-Mitscherlich method, G. VON ROMBERG (*Landw. Vers. Stat.*, 75 (1911), No. 5-6, pp. 483, 484).—This deals with some points in regard to the evacua-

tion and influx of air during the desiccation of soils with the aid of phosphorus pentachloride.

A simple method for determining the mineral substances in water and another for estimating the hardness of drinking and industrial waters, WUNDER (*München. Med. Wchnschr.*, 58 (1911), No. 49, pp. 2611-2613, fig. 1).—The method consists in measuring in milliamperes the amount of a constant current passing through a definite amount of water. The figure obtained is a definite index to the amount of mineral substance present. The hardness of the waters is determined by a solution of lysol, a soapy emulsion of cresols.

A simple method for detecting and estimating the nitrites and nitrates in water, J. TILLMANS and W. SUTTHOFF (*Ztschr. Analyt. Chem.*, 50 (1911), No. 8, pp. 473-495).—The chief advantages of this modified method for determining nitrates and nitrites with diphenylamin-sulphuric acid (E. S. R., 25, p. 14) are as follows: (a) The rapidity and simplicity with which the method can be carried out, because it requires no special form of apparatus; (b) only a few cubic centimeters of water are necessary for the test, even when small amounts of nitrites or nitrates are present. One-tenth mg. of nitrous and nitric acids per liter can be determined with accuracy.

A rapid preliminary test for detecting added water to milk, J. TILLMANS (*Molk. Ztg. Berlin*, 22 (1912), No. 4, pp. 39, 40; *Chem. Ztg.*, 36 (1912), No. 10, p. 81).—The author calls attention to the value of the diphenylamin-sulphuric acid reagent for detecting added water in milk.

The determination of saccharose and the detection of dextrin in some food products, A. F. VOLLANT (*Ann. Falsif.*, 4 (1911), No. 36, pp. 504-509).—Lemeland's method (E. S. R., 24, p. 611) can be used for commercial sugars, sirups, comfits, dried milk, and honey. As dextrin is not attacked to any great extent by this procedure, the method can be employed with the aid of the polariscope for detecting this substance in foods.

Constants of chicken and turkey fats, R. ROSS and J. RACE (*Analyst*, 36 (1911), No. 422, p. 213).—A number of constants are given, as follows:

Constants for fat and fatty acids of chicken and turkey fat.

Constants.	Fat.		Fatty acids.	
	Chicken.	Turkey.	Chicken.	Turkey.
Specific gravity at 100° F. ....	0.9065	0.9090	0.8866	0.8990
Koettstorfer value.....	204.6	191.6	208.3	196.0
Molecular weight.....	71.5	66.4	278.0	287.0
Iodin value (Wijs).....	1.8	3.8	73.6	70.7
Reichert-Meissl value.....	2.1	1.6	.....	.....
Polsenske number.....	.....	.....	25.4	18.4
Acetyl value.....	.....	.....	13.7	9.9
Ricinoleic acid, per cent.....	.....	.....	.....	.....
Hewner value.....	94.6	86.1	.....	.....
Melting point, ° C.....	23 to 27	31 to 32	27 to 30	37 to 38
Zeiss number at 50° C.....	47.5	45.0	26.5	32.5

"The fats were optically inactive. An examination of the fat from fowls which had died of overfeeding invariably showed a higher Zeiss number and iodine value than the normal values given above. This result is generally brought about by the use of too much heating food."

Determination of gliadin or alcohol-soluble protein in wheat flour, R. HOAGLAND (*Jour. Indus. and Engin. Chem.*, 3 (1911), No. 11, pp. 838-842).—The chief differences in the methods used for the determination of gliadin in wheat flour lie in the strength of the alcohol employed and in methods of extraction.

It was found in this work that alcohol of the strength of 45 to 55 per cent by weight will extract all the alcohol-soluble nitrogen, or gliadin, present in wheat flour. A 75 per cent solution (by weight) of alcohol will extract the same amount of protein as distilled water.

Much confusion exists in the literature as to whether the amount of alcohol usually recommended is 70 per cent by weight or volume. If considered on the basis of volume this is equivalent to practically 62.5 per cent by weight.

The method used by the author is as follows: "Weigh approximately 2 gm. of flour into an 8-oz. milk sterilizer bottle, add 100 cc. neutral 50 per cent by weight alcohol; shake in machine for 1 hour, centrifuge for 10 minutes, filter, determine nitrogen in aliquot portion of filtrate by modified Kjeldahl method. Correction is always made for a blank determination run with alcohol, etc. In using a shaking machine it is, of course, necessary to have the bottles shaken vigorously so that the flour will remain in suspension. The use of the centrifuge makes filtration easy, which would otherwise be rather slow, due to fine flour particles in suspension."

The testing of the quality of gliadin in flour, J. APSIT and BROCC-ROUSSEU (*Ann. Sci. Agron.*, 3. ser., 6 (1911), II, No. 2, pp. 81-86, figs. 2).—A description of an apparatus for determining the quality of the gliadin in wheat flour, and which is said to have none of the disadvantages of the Boland and other apparatuses used for this purpose.

In regard to the acids in honey, A. HEIDUSCHKA (*Chem. Ztg.*, 35 (1911), No. 118, pp. 1104, 1105).—This is a continuation of the work previously reported (*E. S. R.*, 26, p. 25), and includes determinations of the total acidity, total volatile acids, formic acid according to the mercurous-chlorid and carbon monoxid methods, and lactic, malic, and phosphoric acids. Citric and succinic acids could not be detected with certainty. Free acids from the wax or higher fatty acids were noted.

The differentiation of almonds from similar seeds, E. HANNIG (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 21 (1911), No. 10, pp. 577-586, figs. 9).—A description of the histological characteristics of almonds, and of peach, plum, apricot, and similar stones.

Determination of malic acid, P. B. DUNBAR and R. F. BACON (*Jour. Indus. and Engin. Chem.*, 3 (1911), No. 11, pp. 826-831).—This has been previously noted from another source (*E. S. R.*, 25, p. 715).

The immersion refractometer as a rapid means of approximating the solids in vinegar, R. E. REMINGTON (*North Dakota Sta. Spec. Bul.*, 2 (1912), No. 3, pp. 40, 41).—Immersion refractometer readings were taken on a series of commercial vinegars, using the undiluted vinegar and at a temperature of 17.5° C. The amount of volatile acid, as acetic acid, was also determined, and the reading for acetic acid solution of this strength, calculated from Wagner's table, subtracted from the reading obtained on the original vinegar. The resulting difference was supposed to be due to the amount of solids present, and an attempt was made to determine this relationship.

The results obtained failed to disclose any marked peculiarity in the solids of cider vinegar, but the author is of the opinion from the abnormalities shown that a large number of determinations on authentic samples of cider vinegar may yield a factor characteristic of this substance.

A method for the detection of small quantities of coumarin, particularly in factitious vanilla extracts, H. J. WICHMANN (*U. S. Dept. Agr., Bur. Chem. Circ.* 95, pp. 2).—The method which is proposed is based on the principle that when fused with potassium hydroxid vanillin will yield the potassium salt of protocatechic acid, and coumarin will yield potassium salicylate. The method is as follows:

"slightly acidify 25 cc. of the extract, if alkaline, with sulphuric acid, add 25 cc. of water, and distill to dryness. To the distillate, containing the vanilla and coumarin, add 15 to 20 drops of 1:1 potassium hydroxid, hastily evaporate the distillate to 5 cc., and transfer to a test tube. Heat the test tube over a free flame until the water completely evaporates and the residue fuses to a colorless, or nearly colorless mass. The reaction previously described will have occurred. Cool the melt and dissolve in a few cubic centimeters of water. Transfer the solution to a 50 cc. Erlenmeyer flask and acidify slightly with 25 per cent sulphuric acid. The amount of solution should not be over 10 cc. Finally distill the solution into a test tube containing 4 or 5 drops of neutral 0.5 per cent ferric sulphate or ferric chlorid. If coumarin is present in the original extract, an amethyst or purplish color will develop, the intensity being directly proportional to the amount of coumarin present.

"Vanillin and other normal constituents of vanilla extract do not interfere with the method."

The estimation of furfural by means of Fehling's solution, L. EYKON and J. H. LANE (*Analyst*, 37 (1912), No. 431, pp. 41-46).—A series of experiments was conducted with Flohil's method, previously noted (*E. S. R.*, 25, p. 108), to determine the influence of various concentrations, both of furfural and sodium chlorid, and to ascertain the degree of accuracy of the method.

It was found, contrary to the statement of Flohil, that the copper-reducing power of furfural is not independent of the concentration, and therefore there appears no ground for the assumption that a simple stoichiometric relation between the furfural and copper exists. The method yielded good results when corrections for concentration were applied, but in a few instances the error was from 3 to 5 per cent. Flohil's statement that the unreduced copper in the liquid after boiling may be determined by Schöorl's iodometric method was confirmed.

Examination of certain milk testing apparatus, H. TIEMANN (*Molk. Ztg. [Hüdsheim]*, 25 (1911), Nos. 32, pp. 591, 592; 33, pp. 605-608).—The forms of apparatus tested in this work were the optical butyrometer and the catalase tube of Lobeck (*E. S. R.*, 23, p. 13), the Gloria centrifuge, the neu-sal apparatus, and an automatic pipette for measuring off alcohol. All of this apparatus is in use in Germany.

The determination of the acidity of milk, O. RAMMSTEDT (*Chem. Ztg.*, 35 (1911), No. 131, pp. 1218, 1219; *abs. in Ztschr. Angew. Chem.*, 25 (1912), No. 9, p. 436).—This should be done on the basis of the Soxhlet-Henkel criterions, both on account of uniformity and exactness.

The methods for determining fat most frequently used in milk chemistry, O. VON SONNEN (*Molk. Ztg. [Hüdsheim]*, 25 (1911), Nos. 45, pp. 849, 850; 46, pp. 863, 864; 47, pp. 887, 888; 48, pp. 903, 904).—The methods described are the Wollny refractometric, Gottlieb-Röse, Soxhlet specific gravity (areometric), acid butyrometric of Gerber, sal, "neu-sal," Sichler's sin-acid, and Hammer-schmidt's precipitation methods.

Do volatile fatty acids occur in fresh whole milk? W. D. KOOPER (*Milchzw. Zentbl.*, 7 (1911), No. 7, pp. 312-314).—According to the author, no volatile fatty acids occur in pure fresh butter fat, and according to this it would naturally be expected that none would occur in fresh milk. He finds, however, that by distilling with steam fresh milk which contains an addition of a little phosphoric acid a distillate containing fatty acids consisting chiefly of butyric acid is obtained. Skim milk with very little fat was found to yield a higher percentage of acid than the distillate from cream. The original acidity of milk also had some influence upon the final results.



A simple method for detecting butter which was prepared from heated cream, HESSE (*Milchw. Zeits.*, 7 (1911), No. 3, pp. 133-134).—The author has previously reported on a study of the Rothenfusser method (*E. S. R.*, 24, p. 612), as applied to the detection of butter which has been prepared from cream heated to 80° C. or over. The method has now been simplified for the purpose of rendering its use possible by the unskilled, and is as follows: To 10 gm. of butter contained in a Gerber butyrometer, placed in a water bath or drying oven at 40 to 50° C., are added 10 cc. of warm water (40° C.), 2 drops of a 3 per cent hydrogen peroxid solution, and a few drops of Rothenfusser's gualacol-paraphenyldiamin solution. The butyrometer is stoppered with a rubber, shaken, and centrifuged for 1 minute. If raw cream was used for making the butter the supernatant layer of the fluid will be colored blue.

Examination of crude and refined milk sugar, A. BURR and F. M. BERBERICH (*Molk. Ztg. [Hildesheim]*, 25 (1911), Nos. 76, pp. 1437-1439; 77, pp. 1461, 1462; 78, pp. 1477-1479).—This article has been previously noted (*E. S. R.*, 26, p. 313).

The electrical conductivity of impure sugar solutions, and its relation to the specific gravity and sugar content, W. TARGENER (*Deut. Zuckerindus.*, 36 (1911), No. 14, pp. 262-264, fig. 1; abs. in *Ztschr. Angew. Chem.*, 24 (1911), No. 28, p. 1338).—As the author was not able to conduct experiments in factories, he prepared fresh press juices instead of diffusion juices. He specifically points out that these investigations are to be considered preliminary tests. It was noted that a relation does exist between the electrical conductivity, specific gravity, and the sugar content of impure sugar solutions.

The unification of reducing sugar methods.—A correction, P. H. WALKER (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 2, pp. 202-209).—Previously noted from another source (*E. S. R.*, 26, p. 312).

A measurement of the translucency of papers, C. F. SAMMET (*U. S. Dept. Agr., Bur. Chem. Ctr.* 96, pp. 3).—A practical procedure is described for measuring the translucency of papers. It is free from the objections usually contained in other methods, and can be used for white as well as colored papers. The results are expressed in terms of a standard which is described.

Change in the acid content of distilled vinegar stored in wooden casks, A. BEHRE (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 23 (1911), No. 9, pp. 506-509; abs. in *Analyst*, 37 (1912), No. 430, pp. 23, 24).—Vinegar stored in wooden casks for a period of 9 months increased in acidity from 7.1 to 9.2 per cent, and in total solids from 0.3 to 0.39 per cent. The concentration of these constituents was in all probability due to the more rapid diffusion of the water through the pores of the wood.

"Further experiments were made in which acetic acid solutions of various strengths were exposed to the atmosphere in glass vessels. In glass cylinders solutions containing from 7.44 to 61.2 per cent of acetic acid scarcely altered in strength during 10 weeks, but when exposed in flasks having narrow necks the more concentrated solutions remained unaltered while those containing less than 19 per cent of acetic acid increased in strength to a slight extent. Considerable changes took place when the solutions were exposed in open beakers; the stronger solutions lost large quantities of acetic acid, while the weaker solutions became stronger. Under these conditions, a vinegar containing 3.17 per cent of acetic acid was found to have 4.68 per cent after the lapse of 4 weeks; a solution containing 19 per cent of acetic acid did not alter in strength; while a solution containing 61.2 per cent lost 2.2 per cent of acetic acid during this period."

Milk sugar, A. BURR and F. M. BERBERICH (*Molk. Ztg. [Hildesheim]*, 25 (1911), Nos. 70, pp. 1323-1327; 71, pp. 1347, 1348; 72, pp. 1361-1363; 73, pp.

1885, 1886, Apr. 5).—This is a consideration of the development of the milk sugar industry of the world, the use of milk sugar, the methods of obtaining and refining milk sugar, the machinery required therefor, the by-products of milk sugar manufacture, and analyses of the ash of milk sugar and its by-products.

The oil of Douglas fir; a preliminary study of its composition and properties, H. K. BENSON and M. DARRIN (*Jour. Indus. and Engin. Chem.*, 5 (1911), No. 11, pp. 818-820).—The conclusion drawn from these tests is that not less than one-third of fir oil consists of terpineol and that fir oil is so closely similar to pine oil in its properties that it may be substituted for it in its commercial application. It is pointed out that pine oil is being used very extensively as a solvent for varnish gums in the cold, for rubber, for nitrocellulose lacquer, in the manufacture of metal polishes, and for general use as an essential oil, and that this market should be open in the future to fir oil.

### METEOROLOGY—WATER.

A new service of agricultural meteorology in France, P. KLEIN (*Vie Agr. et Rurale*, 1912, No. 7, pp. 169, 170; *Internat. Inst. Agr. [Rome]*, Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 3, pp. 607-609).—The service which is now being established in France is described. This service will collaborate with the general meteorological service established in 1885. The new service will be directed by a central committee assisted by technical experts.

District stations will be centrally located in regions having similar meteorological conditions and will as far as possible be attached to scientific institutions, such as observatories and schools of agriculture already existing. These will act as centers for the distribution of forecasts and other meteorological information of regional importance, as well as for the collection of data which may be of importance to the central office.

There will be numerous information and warning stations, also connected where possible with local agricultural institutions. These will receive from the regional stations and give out daily telegraphic reports and other information concerning the principal weather conditions and advice regarding means of protection against unfavorable conditions (storms, frosts, etc.). They will in addition give particular attention to the study of the effect of varying climatic factors on the development of plants and their parasites.

Daily observations in agricultural as well as in pure meteorology will be made at a large number of so-called agricultural posts attached both to the district stations and to the information and warning stations.

Monthly Weather Review (*Mo. Weather Rev.*, 39 (1911), No. 12, pp. 1791-1949, pls. 10).—In addition to the usual climatological summaries, weather forecasts and warnings for December, 1911, river and flood observations, lists of additions to the Weather Bureau library and of recent papers on meteorology and seismology, a condensed climatological summary, and climatological tables and charts, this number contains the following special papers:

December, 1911, Lake Levels; [Meteorological] Summary of Year 1911 [in the Lake Region]; Two Years of Low Water in the Arkansas River, by H. F. Alcatorre; Notes on the Rivers of the Sacramento and San Joaquin Valleys for December, 1911, by N. R. Taylor; Note on Weather Conditions in the San Joaquin Valley for December, 1911, by W. E. Bonnett; Protecting the California Orange Crop from Frost, by A. G. McAule (see p. 141); and Notes on Frost at San Diego During December, 1911, by F. A. Carpenter.

Meteorological observations, A. J. PATTEN and D. A. SEELEY (*Ann. Rpt. Bd. Agr. Mich.*, 1911, pp. 113-126).—Tabulated daily and monthly summaries are

given of observations during 1910 at East Lansing, Mich., on temperature, pressure, precipitation, cloudiness, wind movement, etc.

The climate of Prince George's County, W. H. ALEXANDER (In *The Physical Features of Prince George's County*, Baltimore: Md. Geol. Survey, 1911, pp. 185-206, fig. 1).—The available data regarding temperature and precipitation are summarized. The average annual temperature is 54° F., the annual precipitation 42 in.

Cold air drainage, F. SHREVE (*Plant World*, 15 (1912), No. 5, pp. 140-145, fig. 1).—Temperature observations on and near the flood plain of the Santa Cruz River, and at different elevations (ridge and canyon) in the Santa Catalina Mountains up to 8,000 ft., indicated the flow of a shallow stream of cold air down the canyon, constituting an important factor in the limitation of the upward distribution of desert species of plants. "A number of the most conspicuous desert species range to much higher altitudes on ridges and the higher slopes of canyons than they do in the bottoms and lower slopes of canyons. Samples secured by the writer indicate that there is no essential difference between the soil moisture of ridges and the bottoms of canyons during the driest portions of the year. Neither is there any evidence that desert species would fail to survive in the canyon bottoms if they were somewhat higher in soil moisture content. An explanation of the absence of the desert species from canyon bottoms and their occurrence at higher elevations on ridges must be sought in some operation of the climatic factors rather than in the factors of soil and atmospheric moisture."

The relation between the amount of rainfall and of seepage, LUEDERKE (*Separate from Kulturtechniker* [Breslau], pp. 17, pls. 6, figs. 3).—This is a detailed account of the work and observations with rain and with percolation gages as carried out by Latham in England (*E. S. R.*, 22, p. 15).

Water resources of the Penobscot River basin, Maine, H. K. BARBOWS and C. C. BABE (*U. S. Geol. Survey, Water-Supply Paper* 279, pp. 285, pls. 19, figs. 5).—This paper is "compiled chiefly from the records, reports, and maps of the United States Geological Survey and from the results of surveys made in cooperation with the Maine State Survey Commission. The report includes all data on precipitation, stream flow, water storage, and water power that were available at the end of the calendar year 1909 and is accompanied by plans and profiles of the principal rivers, lakes, and ponds in the basin. It contains also a gazetteer of the water features in the Penobscot basin, by Gertrude E. Schulz."

Surface water supply of the south Atlantic coast and eastern Gulf of Mexico, 1910, M. R. HALL and J. G. MATHEWS (*U. S. Geol. Survey, Water-Supply Paper* 282, pp. 109, pls. 3).—This paper "contains descriptions of the two drainage basins named and the results of stream measurements in them, namely, gage-height records, results of current-meter measurements, and daily and monthly discharges."

Surface water supply of Hudson Bay and Upper Mississippi River basins, 1910, R. FOLLANSBEE, A. H. HORTON, and G. C. STEVENS (*U. S. Geol. Survey, Water-Supply Paper* 285, pp. 378, pls. 4).—Data corresponding to the above are reported for the Hudson Bay and Upper Mississippi River basins.

Gaging stations maintained by the United States Geological Survey 1888-1910 and Survey publications relating to water resources, B. D. WOOD (*U. S. Geol. Survey, Water-Supply Paper* 280, pp. 102).—The list of gaging stations is arranged according to drainage basins and the publications chronologically, but with a finding list arranged alphabetically by States. There is also an index of authors and of streams.

Analyses of artesian and subartesian waters, New South Wales, J. C. H. MINGAYE and H. P. WHITE (*Rpt. Dept. Pub. Works N. S. Wales*, 1911, pp. 48-54).—Mineral analyses of a large number of samples are tabulated.

## SOILS—FERTILIZERS.

The soil forming processes and the main principles of soil classification, P. KOSSOVICH (*Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 11 (1910), No. 5, pp. 679-703).—The author is of the opinion that a general soil classification can not be based upon any combination of outside soil-forming factors (such as climate, parent rock, topography, plant and animal life, and age) and much less upon any single factor, however great its influence may be. A scientific soil classification should be based rather upon the characteristic inner soil properties and soil forming processes.

Bearing in mind that the greater part of soils is of independent formation but that there are some soils (generally low-lying) which contain weathering products transported from other soils, the author divides all surface soils into 2 main classes, the genetically independent and the genetically dependent. On the basis of soil forming processes he divides the first class into the following types: Dry desert, semiarid desert, chernozem, podzol, tundra, upland moor, and lateritic soils. The genetically dependent soils are divided into soils formed with the addition, respectively, of products of the semiarid, chernozem, podzol, and lateritic soil forming processes. See also a previous note (E. S. R., 12, p. 704).

Soils of arid and of humid regions, E. W. HILGARD (*Internat. Mitt. Bodenk.*, 1 (1912), No. 5, pp. 415-429).—This is a brief summary of the more important results of the author's investigations of the physical and chemical properties of arid and of humid soils which, with the exception of certain of the more recent contributions to the subject, are to be found in the author's book on Soils (E. S. R., 18, p. 315), in publications of the California Experiment Station, and in Wollny's *Forschungen auf dem Gebiete der Agrikultur-physik*, 1893.

Soil investigations in the United States, C. L. HENNING (*Internat. Mitt. Bodenk.*, 1 (1912), No. 5, pp. 440-462).—The author reviews the history and organization of the Bureau of Soils of this Department, and discusses in some detail the methods and extent of the soil survey work of this Bureau, including a brief description of the more important soil series of the different soil provinces of the country.

A contribution to the knowledge of Cuban cultivated soils, E. W. MÜLLER (*Tropenpflanzer*, 15 (1911), No. 12, pp. 660-679).—This is an account of a study of the physical and chemical properties and crop adaptation of these soils. Five main groups of soils are distinguished: A light gray colored, or so-called agricultural group; the yellow, red, and dark soils; and a sandy type developed in Herradura and on the Isle of Pines.

The light gray colored soils occupy the western part of Cuba and constitute the typical tobacco soils of the island. They are residuary in character and contain numerous concretions with a high phosphoric acid content. The concretions of the surface soils are rather hard, rounded, and brown in color. Those of the subsoil approach a red color and crumble easily. Analyses showed as high as 20 to 25 per cent. of phosphoric acid in the subsurface concretions. The light gray soils, in general, are open in structure, containing large percentages of stones, gravel, and coarse sand, characteristics which are considered to adapt them for the production of tobacco of a fine grained and an elastic quality, and of superior aroma. They are stated to be well supplied with nitrogen and the mineral constituents of plant food, the analyses reported showing an average nitrogen content of from 0.037 to 0.206 per cent; phosphoric acid, 0.054 to 0.263 per cent; potash, 0.023 to 0.139 per cent; and lime, 0.089 to 0.513 per cent.

The yellow soils occupy the central part of Cuba to the east of Havana. They differ from the light gray soils in their higher content of clay and fewer rock fragments. They have an average content of nitrogen of from 0.115 to 0.286 per cent; phosphoric acid, 0.064 to 0.221 per cent; potash, 0.037 to 0.182 per cent; and lime, 0.127 to 0.892 per cent.

The red soils occupy a considerable area in east central Cuba and are characterized by their high clay content, being derived from weathered limestone rich in iron, alumina, and silica, and by high lime and phosphoric acid contents. Tobacco is the principal crop. In the extreme eastern part of the region there occur rather extensive areas of washed soils which differ from the typical red soils in that they are less porous and more moist. Sugar cane is the principal crop grown thereon. The analyses of these soils showed for nitrogen from 0.192 to 0.200 per cent; phosphoric acid, 0.010 to 0.706 per cent; potash, 0.072 to 0.514 per cent; and lime, 0.278 to 15.040 per cent.

The black soils occupy the eastern lowland region of Cuba. They are noted for their high calcium carbonate and very high nitrogen contents. It is believed that the dark color is due to the large amounts of plant debris from the sugar cane. Analyses showed nitrogen, 0.045 to 0.422 per cent; phosphoric acid, 0.030 to 0.356 per cent; potash, 0.038 to 0.356 per cent; and lime, 1.038 to 53.329 per cent.

The sandy soils of Herradura and of the Isle of Pines are used for the production of citrus fruits. They are stated to be poor in the mineral constituents of plant food, analyses reported showing nitrogen, 0.076 to 0.104 per cent; phosphoric acid, 0.011 to 0.021 per cent; potash, 0.004 to 0.006 per cent; and lime, 0.002 to 0.031 per cent.

The use of fertilizers is stated to be quite general on all the soil types.

Incidentally, analyses of bat guano deposits of the mountain caves of western Cuba are reported. These deposits, although being used as a fertilizer, are not very extensive and are generally low in plant-food constituents.

Soil investigations, W. P. KELLEY (*Hawaii Sta. Rpt. 1911, pp. 43-51, figs. 2*).—Brief reference is made to previous investigations on pineapple soils (E. S. R., 24, p. 621) and an account is given of a further study of movement of water in different Hawaiian soils. These studies included measurements of the rate of capillary rise and percolation of water through columns of soil in glass cylinders.

The results show that capillary movement of water in the soils varies between wide extremes. It was most rapid in the experiments here reported in humus sandy soil and slowest in clay soil. Percolation was slowest through soils containing the highest percentage of clay and fine silt.

Brief reference is also made to a comparison of methods of determining the so-called humus in soils (E. S. R., 27, p. 7) and to the beginning of work on a soil survey of the islands.

The origin, composition, and properties of the manganiferous soils of Oahu, W. P. KELLEY (*Hawaii Sta. Bul. 26, pp. 42-56*).—These soils, which are located on the upland plateau between the Waianae and Koolau Mountain ranges, at an elevation of from 650 to 900 ft., frequently contain 5 per cent of manganese oxid ( $MnO_2$ ) and sometimes as much as from 9 to 10 per cent.

A study of the chemical composition of the lava from which the soils are derived and of the lava alteration products, as well as of the position in which the soils occur, indicates "that the concentration of manganese has come about through the action of solution and leaching, followed by subsequent oxidation and deposition." The manganese has become soluble in the normal weathering of the basaltic lavas and has been transported and redeposited from the solution.

"The occurrence of manganese concretions, the largest in size of which being some depth below the surface, and deposited in the lower levels in the alluvial sheet but not in the sedimentary or residual soil, together with the sharp line of stratification separating the alluvial from the residual strata, indicate that there has been a submergence, during which time the deposition of the alluvial soil and the accumulation of manganese concretions took place. Subsequent leaching further accentuated the accumulation of the manganese in the lower places, especially in basins or at the bases of long slopes.

"The solubility in weak organic acids shows that the availability of the manganese is relatively high and that manganese probably exists in the soil moisture and in solution around the absorbing surfaces of roots in greater quantities than any other element. Therefore it exists in just the condition to exert its full physiological effects on plants. The physical properties of the manganiferous soils are more nearly ideal than are those of red soils. They contain less clay, and more of the coarser particles. Consequently the circulation of air is greater in the manganese soil.

"Nitrification and ammonification appear not to be influenced by the presence of manganese in the soil. That the former has been found to take place more advantageously in the manganese soil can probably be accounted for by the fact that the circulation of air is less obstructed in this type."

**Modification of the method of mechanical soil analysis,** C. C. FLETCHER and H. BRYAN (*U. S. Dept. Agr., Bur. Soils Bul. 84, pp. 3-16, pls. 7*).—This bulletin describes the apparatus and methods used in making the mechanical analysis of soils as at present carried out in the laboratory of the Bureau of Soils.

The most important modification of previous methods is that for determining the amount of clay. It was decided to abandon the final transfer of the clay solution to the platinum dishes and to complete the evaporation in the enameled-ware saucepans and to weigh the clay in them without transfer. Much smaller enameled cups (about 300 cc. capacity and 180 gm. weight) were adopted for convenience in weighing and to decrease the likelihood of the entry of dust. It is stated that the method has the disadvantage of requiring a much heavier balance, but the determinations are none the less accurate and a great saving in time is effected. The method may be still further shortened in case of routine analyses by abandoning altogether the direct determination of clay and obtaining its percentage by difference. "The error thus introduced is probably no greater than that involved in the centrifugal (or other) separation of the clay from the silt. The errors in both cases are generally within the limits of variation which may be expected between different samples of the same soil.

"In 100 consecutive analyses taken at random from the recent files of the Bureau of Soils the variations between the percentage of clay as directly determined and those obtained by difference range between 0 and 2.23 per cent. In 2 cases the variation is over 2 per cent; in 3 cases, between 2 per cent and 1.5 per cent; and in 6 cases between 1.5 per cent and 1 per cent. In all other cases the variations were less than 1 per cent.

"It is probable that in many cases the determination by difference is the more accurate, as all errors due to access of dust or to loss of clay suspension are thus avoided. Errors due to a not impossible change in the state of hydration of the clay are also eliminated. It is believed that in the vast majority of cases the method of determining clay by difference will be accurate within 1 per cent, and no greater accuracy is necessary or even desirable for purposes of soil classification. . . . The direct determination must, of course, be retained for cases of special importance or where a check is necessary, and is probably also desirable for students and for small laboratories where a mechanical analysis is only made occasionally."

The estimation of certain physical properties of soil, G. AUCHINCLOSS (*West Indian Bul.*, 12 (1912), No. 1, pp. 50-68).—In this article an attempt is made to coordinate the work of a number of investigators in the West Indies in estimating the shrinkage and friability of soils and the relation between these properties of the soil and its crop-bearing power.

In determining the shrinkage the soil sample was first kneaded to a proper degree of plasticity. "A brick is then made by pressing the kneaded sample into the space between 2 small cleats nailed on a length of board, the cleats being 1 in. high, 1 in. apart, and 3 in. long. The ends and top of the brick are then trimmed level with the edges of the cleats, and the brick removed. Two fine pins are inserted to their heads into the brick, at as nearly as possible 50 mm. apart, and the interval between them accurately measured with a pair of dividers or directly by means of a scale. The brick is then laid on its side and left to dry gradually, and the interval between the pins is measured daily until shrinkage ceases."

Trials with this method on the surface and subsoil of several cacao fields showed that cacao did not grow well in surface soils with a shrinkage of over 10 per cent, whereas in soils under 10 per cent good growth was made. In subsoils with a shrinkage of over 12 per cent the plant did poorly, and under 12 per cent good growth was made. It is believed "that the estimation of shrinkage is capable of a considerable degree of accuracy. Future efforts should be along the lines of erecting standards of shrinkage for various crops, and of investigating further the accuracy of the standard temporarily adopted for cacao. The subsoil should be looked on as of perhaps greater importance than the top soil when dealing with deep rooting and permanent crops. Much good work remains to be carried out in determining the limits of shrinkage to be assigned to soils for various crops, and citrus fruits, cotton, rubber, sugar cane, and spices should eventually be brought under the similar standards and have their respective suitable areas assigned to them."

The determinations of friability were carried out by molding cylinders of soil of definite diameter and length and subjecting them to end-pressure until they broke, the weight necessary being recorded. The method was found to be accurate enough to classify soils on broad lines. As with the determination of shrinkage, it is believed that the method can be much improved and that standards of friability for soils and for special crops should be erected. The ratio of shrinkage to clay content in samples of a given soil may "afford a ready means of determining the approximate percentage of agricultural clay in a sample of soil, without having recourse to elaborate and tedious methods of physical soil analysis; if so, it should serve as a valuable aid to the soil analyst, inasmuch as it would enable a considerable amount of useful information to be obtained with a small expenditure of labor. Once a physical type for a soil has been established, it should be possible to study by means of it, in considerable detail, local variations from the type."

The determination of hygroscopicity and the value of physical analyses of soils, E. A. MITSCHERLICH and R. FLOESS (*Internat. Mitt. Bodenk.*, 1 (1912), No. 5, pp. 463-480).—In comparative tests of the Rodewald-Mitscherlich method of determining the hygroscopicity (E. S. R., 15, p. 847) and of the Ehrenberg-Pick modification of it (E. S. R., 24, p. 521), and studies of the relation of hygroscopicity and physical constitution of soils to plant growth, the Ehrenberg-Pick modification proved unreliable because of the condensation of water and the growth of molds in the soil as a result of the length of time required to bring about vapor equilibrium. The hygroscopicity, as determined by this method, varied with the water content of the original soil, and changes in the surface area of the soil could not be estimated. The importance of hygro-

activity and the colloidal material of the soil in relation to the physics and chemistry of plant growth is discussed.

**The drying of soils.** G. A. RITTER (*Centbl. Bakt. [etc.]*, 2. Abt., 33 (1912), No. 1-6, pp. 116-143).—Studies are reported of the bacterial activity of wet and of dried soils as measured by the formation of acid and of carbon dioxide in culture solutions, as affected by the physical and chemical properties of the soil, the character of the culture medium, the kind of vegetation, alternate drying and wetting, rate and degree of drying, and temperature. The Remy method or a modification of it was used.

There was found to be a difference in the bacterial activity of the dry as compared with that of the wet soils, the dry soils causing a quicker and more intense fermentation. These differences were most marked at the beginning of fermentation but later tended to disappear. The time of reaching the maximum formation of acid varied for the different soils, but always was shortest for the dry soils. The maxima of acid formation varied with the different kinds of soil as well as with the water content of a given soil, although the latter variation, excepting in a wet and heavy clay soil, was for the most part unimportant and often fell within the limits of experimental error. The calcium carbonate content of the soils also influenced somewhat the formation of acid, but the virulence of the bacteria as determined by the physical and chemical properties of the soil was the determining factor. It is held that the extent of variation in the physiological relations in wet and in dry samples of the same soil is determined by or is a function of the bacterial activity of the soil.

The author asserts that the Remy method of bacteriological soil investigations is correct in principle. He urges that attention be given to the elimination of variable factors which may vitiate the results, such as variable water content of the soil, careless methods of preserving soil samples, and variations in temperature and light.

**The oxygen content of soil water and its influence on the swamping of the soil and the growth of forests.** A. H. HESSELMAN (*Meddel. Stat. Skogs-försökst. (Mitt. Forstl. Vers. Anst. Schwedens)*, 1910, No. 7, pp. 91-125 + XIII-XVI, figs. 5).—Studies of the oxygen content in surface and subsoil waters of forest swamps and of the absorption of oxygen from water by different forest molds and soils are reported with a view of determining the cause of the swamping of pine forests in northern Sweden.

The results, in general, showed that where there was sufficient movement the water was well supplied with oxygen. The water of the moors of swamped pine forests contained no oxygen at a depth of 20 cm. Near the surface it contained traces of oxygen. Sphagnum layers reduced the oxygen content of the water. The absorption of oxygen was much less for beech forest than for pine forest soils and for sterilized neutral than for unsterilized soils, and less for the humus of a rapidly growing pine forest than for that of a swamping forest.

The general conclusion drawn from these studies is that the swamping of forest soils of Sweden is not due to overabundance of water but to its low oxygen content. In some places, where the water was in motion and thus aerated, pine forests made a very vigorous growth even where the soil was covered with water.

**Evaporation from irrigated soils.** S. FORTIER and S. H. BECKETT (*U. S. Dept. Agr., Office Expt. Stas. Bul.* 248, pp. 77, pls. 2, figs. 27).—This bulletin reports a continuation of experiments reported upon in a previous bulletin (*U. S. R.*, 18, p. 1087), extending the observations to colder and more elevated regions.

Observations by the methods described in the previous bulletin were made in cooperation with several experiment stations on the effect on evaporation with



soil mulches of different depths, cultivation to different depths, and shallow and deep furrow irrigation.

The results show that a dry granular soil mulch 3 in. deep reduced the loss by evaporation from the soil at least one-half, a mulch 6 in. deep saved 75 per cent of the evaporation, and a 9-in. mulch was still more effective in reducing evaporation, but was too expensive to be of practical value. The effect of cultivation in lessening evaporation was especially marked in case of the heavier soils. "There is a tendency in light sandy soils for the uncultivated surfaces to mulch themselves, and after the first few days following the irrigation the losses diminish very rapidly, and in the end little advantage is shown in favor of cultivation."

The loss of water decreased with the depth of application. "Practical considerations, however, limit the depth. Under conditions such as exist throughout the arid region this practical limit lies, it is believed, somewhere between 6 and 9 in. . . . In general, it may be stated that wherever the soil and the crop will permit the water should be applied in deep furrows rather than by flooding; that one deep, heavy irrigation is preferable to numerous lighter irrigations, providing the crop is deep-rooted; that cultivation should be practiced as early as possible after irrigation; and that deep and frequent cultivation prevents evaporation and aerates the soil."

**Effect of heat and oxidation on the phosphorus of the soil, P. P. PETERSON** (*Wisconsin Sta. Research Bul. 19, pp. 16*).—The author briefly reviews previous investigations on the subject, and reports the results of studies of the effect of heat and of oxidation with hydrogen peroxid on the solubility of phosphoric acid of the soil and of wavellite and dufrenite.

Heating wavellite for 5 hours to 200° increased the solubility of the phosphoric acid from 4 to 50 per cent, and heating it to 240° increased the solubility to 100 per cent. Dufrenite, when heated to 200°, was but slightly increased in solubility.

The increase in solubility of the phosphoric acid of the soil was small at 150° and rose rapidly with a rise in temperature above this point, reaching a maximum at 200°. The solubility of the phosphoric acid in clay and clay loam soils was increased on an average about 50 per cent by decomposing the organic matter with hydrogen peroxid. For sandy soils the increase was about 30 per cent. The increase in solubility by treating with hydrogen peroxid was always larger than that due to heating, and there was no increase in solubility by heating after treatment with hydrogen peroxid. The phosphoric acid rendered soluble by heating was from the same source as that obtained from oxidation with hydrogen peroxid. The solubility of the mineral phosphates of the soil did not seem to be increased by heating to 240°. The increase in solubility was greater in the early than in the later stages of oxidation, being greatest when from 25 to 30 per cent of the organic matter had been decomposed and ceasing with 60 per cent.

The solubility of calcium and manganese was not increased by oxidation, that of iron and aluminum was increased, the increase following pretty closely that in the solubility of phosphoric acid. "The increased solubility of phosphorus by oxidation with hydrogen peroxid probably comes, in large part, from precipitated iron and aluminum phosphates, held from solution before the oxidation as part of a complex of insoluble organic matter and compounds of iron and aluminum. Oxidation increases the solubility of the phosphorus but slightly in subsoils. Heating after oxidation has a more marked effect on the solubility of the phosphorus in the subsoil than it has in the surface soil."

**Methods of determining the intensity of respiration of bacteria in the soil, J. STOKLASA** (*Zischr. Landw. Versuchs. Österr., 14 (1911), No. 11, pp.*

1279, figs. 2; abs. in *Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 2, pp. 376-378).—This is a report of a continuation and extension of previous work by the author (E. S. R., 18, p. 1024). A special form of apparatus used in these investigations is described, and the results of studies of the effect of cultivation, fertilization, kind of crop, and composition of organic matter on the intensity of respiration of bacteria in the soils are reported.

The essential part of the apparatus used was a glass cylinder fitted with a sieve at about 5 cm. from the bottom. The soil was placed in the upper part of the cylinder, and sterilized air (or hydrogen for anaerobic bacteria) was introduced into the bottom of the cylinder by means of a glass tube. A second tube, projecting a few centimeters into the top of the cylinder, conducted the carbon dioxide evolved from the soil through the apparatus for its absorption and determination. The cylinder containing the soil was kept in a thermostat during the experiment so that the temperature could be carefully regulated.

The bacterial activity as measured by the amount of carbon dioxide given off was influenced not only by the mechanical condition and fertility of the soil, but also by the kind of crop grown. The greater the air space of the soil the greater was the intensity of respiration of the bacteria.

By sterilizing the soil and inoculating it with equal quantities of bacteria of the same virulence it was possible to determine by means of the carbon dioxide given off the power of the bacteria to decompose the organic matter in the soil, and the author concludes that intensity of respiration of bacteria is a better basis for judging the biological activities of soils than the amount of organic matter present. Intensity of respiration shows the presence in the soil not only of active bacteria but also of easily decomposed organic matter.

The chemical composition of the drainage water was also found to furnish a means of judging the intensity of the biochemical processes in the soil. It was found, for example, that the calcium bicarbonate content of the drainage water increased with the bacterial activity, irrespective of the lime content of the soil, and stood in direct relation to the carbon dioxide produced by the soil micro-organisms. This tends to show that the determination of the carbon dioxide given off by a soil furnishes a reliable means of judging of the transforming power of both autotrophic and heterotrophic bacteria in the soil, and that the amount of carbon dioxide produced by a given quantity of soil in a unit of time at a fixed temperature and known degree of moisture represents accurately the physiological combustion taking place and makes it possible to compare the bacterial activity in different soils. This varies widely with (1) the air or water capacity of the soil, (2) the character and amounts of decomposable organic matter in the soil, (3) the presence of organic and inorganic nitrogenous substances and of easily assimilated substances containing phosphorus, potash, etc., (4) the number of autotrophic and heterotrophic bacteria, and (5) the chemical reaction of the soil.

The most active respiration occurs in neutral or slightly alkaline soils abundantly supplied with air and with readily assimilable nitrogen, phosphorus, sulphur, chlorine, potash, soda, magnesia, lime, iron, alumina, and manganese. The presence of alumina is necessary to the ready assimilation of iron and manganese by autotrophic and heterotrophic bacteria.

The form of nitrogen has a marked influence in determining the character of bacteria predominating in a soil, and hence the intensity of respiration. In forest soils, for example, bacteria which by preference assimilate organic nitrogen predominate. In soils in which nitrification is active the predominant bacteria are those which readily assimilate nitric nitrogen. On the other hand,

bacterial respiration is intensified by applications of various substances to the soil according to the character of the bacteria present. Those soils showing low bacterial activity are likely to be most benefited by applications of nitrates. If applications of monocalcium phosphate and potassium chlorid increase the production of carbon dioxide this is an indication that the soil is deficient in assimilable phosphoric acid and potash.

Toxic effects of "alkali salts" in soils on soil bacteria.—II, Nitrification, C. B. LIPMAN (*Centr. Bakt. [etc.]*, 20 *Abt.*, 33 (1912), No. 11-14, pp. 305-313, figs. 2).—This is a second communication on this subject, the first (*E. S. R.*, 26, p. 322), dealing with the effect of the alkali salts on ammonification.

Summarizing his results, the author concludes that "nitrification in soils is inhibited by the presence of certain amounts of each of the 'alkali salts' sodium chlorid, sodium sulphate, and sodium carbonate. Sodium carbonate is the most toxic, sodium sulphate the least toxic, and sodium chlorid occupies an intermediate position. The actual points at which these salts become markedly toxic toward nitrification in soils are at about 0.025 per cent sodium carbonate, 0.35 per cent sodium sulphate, 0.1 per cent or less of sodium chlorid. The anion bears an important relation to the toxic effects of salts as illustrated in the results above discussed, a fact which has not received very much consideration in the past. The salt effects noted should, like results obtained on ammonification in work above cited, have an important bearing on the practical reclamation of alkali lands. The nitrifying bacteria are affected similarly to the higher plant by the alkali salts and quite differently from the ammonifying bacteria."

Maintenance of soil fertility: Plans and summary tables (*Ohio Sta. Circ.* 120, pp. 95-115, figs. 5).—This is one of the annual statements on the subject (*E. S. R.*, 26, p. 423), bringing the data for the experiments up to the end of 1911 and summarizing the results for 18 years (1894-1911).

Reaction changes in the soil by growth of plants and fertilizing, J. G. MASCHHAUPT (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwoverproefstat. [Netherlands]*, 1911, No. 10, pp. 50-93, pls. 4; *abs. in Chem. Abs.*, 6 (1912), No. 11, p. 1487).—Previous investigations on the subject are reviewed, and studies of the effect of the growth of plants on the reaction of solutions of ammonium, potassium, sodium, calcium, and magnesium nitrates, sulphates, and chlorids are reported.

The tests were made (1) by growing the plants in soil in flowerpots with perforated bottoms, the roots being allowed to dip into breakers which contained, alternately, pure solutions, and sand saturated with solutions of the salts named; and (2) by growing the seedlings in the solutions of the salts. It is stated that the first method was well adapted for the purpose of these experiments and that it has a decided advantage in that the plants are grown in the natural soil conditions. Better results were obtained when the roots of the seedlings were first developed to some extent in a culture solution before transferring to the solutions of pure salts. It was thought that a study of the effect of plant growth on the reaction of the solutions would indicate the conditions which may arise in the soil from continued application of a fertilizer containing a predominance of any one salt.

The results of the studies show that sodium nitrate was physiologically alkaline. In one case, using rye, an alkalinity of 0.006-normal was obtained. The alkalinity was substantially increased in sand culture, 0.028-normal being obtained with corn. Ammonium sulphate was physiologically acid, the highest degree of acidity being 0.015-normal obtained with corn in sand culture. Ammonium nitrate was physiologically acid but less so than the sulphate. This result is stated to agree with the work of D. N. Prlanishnikov (*E. S. R.*, 17,

p. 538), who observed a favorable influence of ammonium nitrate on the assimilation of phosphoric acid from difficultly soluble phosphates. In 2 tests, with the entire root system in the solution, ammonium nitrate gave a weakly alkaline reaction. Potassium nitrate was generally physiologically alkaline, but weaker than sodium nitrate. Calcium nitrate was physiologically alkaline. Ammonium chlorid was decidedly acid, and very injurious to the roots. Solutions of potassium, sodium, magnesium, and calcium chlorids and sulphates were weakly alkaline.

The general conclusion drawn from these studies is that the change in the reaction of the solutions was not determined solely by the process of assimilation of one or of the other ion by the plant roots, but that there was an exosmose of calcium and potassium (and probably other elements) from the root cells. This phenomenon of exosmose is regarded as the probable explanation of the toxicity of the solutions of pure salts and makes intelligible the action of calcium salts in lessening the toxicity of pure salt solutions.

**Influence of phosphatic and potassic fertilizers on the chemical composition of the forage of natural pastures.** P. CHAVAN (*Ann. Agr. Suisse*, 12 (1911), No. 4, pp. 259-272, figs. 3).—Analyses of grasses, legumes, and other plants growing on Alpine grass lands near Sécley, Switzerland, are reported, showing that fertilizing with phosphates increased the cellulose content of the plants as a result of the influence of the phosphoric acid in hastening maturity. Fertilizing with phosphates and potassic fertilizers increased the phosphoric acid and potash content of the ash of the plants. The use of both fertilizers, but particularly the phosphatic fertilizer, promoted the absorption of nitrogen from the soil by Gramineæ and other families of plants. They also increased the fertilizing effect of the organic matter of the soil. Phosphatic fertilizers increased the potash content of the plants. These results differ materially from those reported by A. Stutzer, who found that phosphatic fertilizers had little effect upon the yield of Gramineæ, increased but slightly their content of phosphoric acid, and did not increase the potash and nitrogen content of the plants.

**The after effect of fertilizing with various potash rocks on moor soils.** H. VON FEILITZEN (*Deut. Landw. Presse*, 39 (1912), No. 21, p. 250, fig. 1).—A brief account is here given of comparisons of phonolite, nephalin, and similar substances with potash salts. These showed that there was an appreciable after-effect of both the phonolite and the nephalin, but that during the second year as well as the first the increase did not compare with that obtained with the water-soluble Stassfurt salt.

**Experiments on the action of kainit, 40 per cent potash salt, and phonolite, 1904-1910.** W. SCHNEIDWIND, D. MEYER, and F. MÜNTER (*Arb. Deut. Landw. Gesell.*, 1911, No. 193, pp. 173; *abs. in Zentbl. Agr. Chem.*, 41 (1912), No. 3, pp. 165-170).—This is a detailed account of pot experiments on (1) absorption of potassium and sodium salts in fall and spring fertilizing, (2) the action of sodium chlorid and sulphate and magnesium chlorid and sulphate on fodder beets, (3) the action of increasing amounts of sodium and magnesium chlorids and magnesium sulphate on plant growth, and (4) the action of phonolite and Pohl zeolite fertilizer (lime trass) in comparison with potassium chlorid and carbonate; and field experiments comparing the potash fertilizers named on potatoes, sugar beets, fodder beets, wheat, rye, and barley.

Among the more important general conclusions arrived at from these experiments were that spring application of potash fertilizers gave decidedly better results than fall application on sandy soils in case of pots which had not been freshly filled in the fall. This is ascribed to the washing out of potash from the soil with fall application. Spring applications were better in all cases with

loam soils. This result is ascribed to the strong absorptive power of such soils for potash.

A decided increase in yield of fodder beets followed applications of sodium chlorid and sodium sulphate, especially the former. No such result was obtained in the case of magnesium salts, and magnesium chlorid was positively harmful. Magnesium chlorid, and in certain cases sodium chlorid, increased the assimilation of soil potash without increasing the yield.

Large applications of magnesium sulphate (0.25 to 0.5 per cent) produced beneficial results, especially on calcareous loam soils, and even with applications of 1 per cent there was an appreciable increase in yield of grain on such soils. Similar results were obtained with sodium sulphate. On sandy soils, however, the sulphates were injurious in all cases, but not to the same extent as the chlorids. Magnesium and sodium chlorids applied at the rate of 0.25 per cent were not injurious on calcareous loam soils, but were injurious when applied in double this amount. On loam soils poor in lime applications of 0.25 per cent reduced the yield of grain and on sandy soils these salts in all amounts applied absolutely prevented the growth of plants. The chlorids increased the assimilation of lime while the sulphates reduced it.

It is pointed out that these results obtained in pot experiments are obviously not applicable in practice except in so far as they indicate that sulphates may be safely used in larger amounts than the chlorids. Phonolite showed very little effect as compared with potassium chlorid and carbonate applied to potatoes, wheat, and a mixture of oats and clover.

The field experiments indicated that potash salts were not needed for potatoes which had received a liberal application of manure. On sandy soils spring application of potash salts gave better results than fall application. The percentage of starch was lower, but the total yield was larger. On loam soils the reduction in starch was greater than that in sandy soils. There was little difference as regards the effect of spring and fall application, except that in general the starch was reduced to a greater extent by spring application. The yield was slightly less with 40 per cent potash salt, and the starch content slightly greater, than with kainit. Normal applications of phonolite were almost without effect; larger applications had little effect upon yield but showed less reduction of starch content than the potash salts. Potassium carbonate increased the starch content of potatoes.

The potash fertilizers increased the yield of dry matter and sugar in sugar beets on all soils, the best results being obtained with fall application. On loam soil 40 per cent potash salt and kainit were about equally effective. The 40 per cent salt was slightly better on heavy soils. Phonolite was almost without effect on sugar beets.

Potash salts increased the yield of fodder beets both with and without manure except on humus soils (with manure). Slightly larger yields were obtained with fall application. The 40 per cent salt gave a slightly larger yield of dry matter than kainit. Like the potato, but unlike the sugar beet, the fodder beet appears to be especially sensitive to large applications of potash salts. Phonolite had little effect.

Fall application of potash salts gave better results than spring application on wheat. Kainit and 40 per cent salt were about equally effective on humus loam soil. On heavy loam soil the 40 per cent salt gave better results. Phonolite was ineffective.

No benefit was obtained from the use of potash salts on rye. The results were very variable with barley, and were inconclusive as regards spring and fall application. The 40 per cent salt appeared to be somewhat more effective than the kainit for this crop.

On the availability of the potash in "rapakivi" and pegmatite granites, O. ASCHAN (*Ztschr. Anorgan. Chem.*, 74 (1912), No. 1, pp. 55-73; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 4, p. 195).—These granites were subjected to various treatments, including the action of lime water, sulphuric acid, hydrochloric acid, calcium chlorid, lime and salt mixture, and peat, in order to find a practical means of rendering the potash which they contain in the form of feldspar available for fertilizing purposes.

The results indicate that treatment with acids is not a practical method. Practically complete solution of the potash was obtained by fusion with calcium chlorid or with lime-salt mixture, the former being considered perhaps the better method if the calcium chlorid can be obtained cheaply. The greater part of the potash was made soluble as hydroxid by heating under pressure with lime water. The solubility of the potash and phosphoric acid in the fine ground feldspar was increased to a marked extent in the course of 6½ months when mixed with moor soil at the rate of 1 part of feldspar to 9 of soil. The solubility was still further increased when ammonium sulphate was added to the mixture.

Factors influencing the availability of rock phosphate, E. TRUOG (*Wisconsin Sta. Research Bul.* 20, pp. 17-51, figs. 4).—Previous investigations on this subject are reviewed, and studies of the effect of fermenting manure and grass, and of thoroughness of mixing with the soil, on the availability of floats are reported.

In laboratory experiments in which organic matter was composted with raw phosphates there was little or no solvent action of the fermenting material. The solvent action was apparently measured by the amount of phosphate which the water containing carbon dioxid could hold in solution, and in the laboratory experiments a state of equilibrium in this respect was quickly reached and there was no further solvent action. Under field conditions, however, there was a continual removal of the dissolved substances, resulting in conditions which greatly increased the solvent action of the carbon dioxid.

The mixing of floats with manure caused an immediate decrease in the solubility of the phosphoric acid in 0.2 per cent citric-acid solution, indicating "that the availability of phosphates as measured by a solvent like 0.2 per cent citric acid may be entirely different from availability as measured by growing crop."

When floats was thoroughly mixed with the feeding area of the soil its availability was increased to such an extent that some species of plants were apparently able to secure almost an adequate supply of phosphoric acid from this material. Apparently the carbon dioxid given off by the plant roots was instrumental in increasing the availability of the phosphoric acid of the floats. The addition of manure to the soil greatly increased the carbon dioxid production and for a short time measurably increased the solvent action on floats.

The general conclusion, therefore, is that the use of organic matter in connection with floats increases its availability to plants. "The organic matter brings about this increased availability by favoring a more efficient initial mechanical distribution of the floats with the soil and by favoring the chemical and biological processes that give rise to carbon dioxid and other agencies which attack floats and ultimately give the material a finer and more uniform distribution through the soil."

Report of a reconnaissance of the Lyon nitrate prospect near Queen, N. Mex., E. E. FREE (*U. S. Dept. Agr., Bur. Soils Circ.* 62, pp. 6, figs. 5).—The examinations reported show the occurrence of small amounts of potassium nitrate, but not enough "to have any important commercial value."

The present status of the artificial nitrogen fertilizer industry, F. W. DAFERT (*Ztschr. Landw. Versuchs. Osterr.*, 15 (1912), No. 1, pp. 107-119; *Monatsh. Landw.*, 5 (1912), No. 1, pp. 1-8).—This is a review of the present status of the manufacture of ammonium sulphate, nitric acid, lime nitrogen, and nitrids, describing briefly the principal processes which have been proposed for this purpose and have shown commercial possibilities. The author is of the opinion that among these are processes which can be profitably used whenever there is commercial necessity for supplementing present supplies of nitrogenous fertilizers.

Some recent experiments with calcium cyanamid or nitrolime, and their practical bearing (*Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 3, pp. 649-657).—This is a summary of the more important results of the principal recent investigations on this subject, with a bibliography of 18 references.

Marl for soil improvement from various formations in Hanover, A. ROSENBACH (*Jour. Landw.*, 59 (1911), No. 4, pp. 407-418; *abs. in Chem. Abs.*, 6 (1912), No. 5, p. 663).—Attention is called to the variation in the use of the term marl, and it is pointed out that many so-called marls contain a very small amount of lime and owe their fertilizing value chiefly to their phosphoric acid content. This is true of a large number of marls and associated deposits from the region of Göttingen, of which analyses are reported.

The sootfall of London: Its amount, quality, and effects (*Lancet [London]*, 1912, 1, No. 1, pp. 47-50, fig. 1).—This article reports observations on the amount and character of soot falling in London, from which it is estimated that on the 117 square miles comprising the administrative county of London, including the city proper, there is an annual sootfall of 76,050 tons containing 8,000 tons of ammonia, 8,000 tons of sulphate ( $\text{SO}_4$ ), and 3,000 tons of chlorine as chlorides.

Fertilizers: Their source, purchase, and use, C. B. SMITH (*Redlands, Cal.*, 1911, 2. ed., rev. and enl., pp. 67, pls. 2, figs. 2).—This is a second revised and enlarged edition of this book, which, it is stated, was "written for the use of farmers and fruit growers, with special reference to citrus culture."

Fertilizers in 1912, C. GUFFEY (*Vie Agr. et Rurale*, 1912, No. 10, pp. 233-240).—A brief review is given of progress in fertilizer investigations in 1912, more particularly those relating to the fertilizing effect of manganese, sulphur, magnesium, chlorine, sodium chlorid, boron, chromium, and radioactive minerals, soil inoculation, rôle of water in plant growth, standard and new nitrogenous fertilizers, phosphatic and potassic fertilizers, lime, gypsum, and manure, as well as those bearing on the use of fertilizers against plant parasites and diseases.

Inspection and analyses of commercial fertilizers, P. F. TROWBRIDGE ET AL. (*Missouri Sta. Bul.*, 99, pp. 117-181).—Analyses and valuations of 833 samples of fertilizers inspected during the spring and fall of 1911 are reported.

Commercial fertilizers (*Off. Rpt. Sec. Ohio Bd. Agr. on Com. Ferts.*, 1911, pp. 208).—This is a report of the official fertilizer inspection in Ohio in 1911, giving the text of the fertilizer law which became effective December 1, 1911, and analyses and valuations of 695 brands of fertilizers examined during the year, with discussions of the results and of the nature, purchase, and use of fertilizers.

Tabulated analyses of commercial fertilizers, W. FREAR (*Penn. Dept. Agr. Bul.*, 218, pp. 77).—This bulletin gives the results of fertilizer inspection, including analyses and valuations, in Pennsylvania from August 1 to December 31, 1911.

Licensed commercial fertilizers, 1912, F. W. WOLL (*Wisconsin Sta. Circ. Inform.*, 31, pp. 12, 13).—A list of manufacturers and brands licensed for the year 1912.

## AGRICULTURAL BOTANY.

**The function of manganese in plant growth,** W. P. KELLEY (*Hawaii Sta. Bul.* 26, pp. 7-41).—A study has been made of the function of manganese in plant growth, in which the author, after describing its occurrence in plants and reviewing previous investigations, gives accounts of field and pot cultures with different plants, the principal observations being made with pineapples.

It was found that different species of plants vary decidedly when grown on manganiferous soils. Some are stunted in growth and die back from the tips of the leaves, while others appear unaffected and so far as can be determined vegetate normally in the presence of manganese. Microscopic investigations showed that certain changes take place in the protoplasm of the cells, the chlorophyll in a number of plants being affected. In pineapples it undergoes complete decomposition, the chloroplasts often becoming disintegrated and losing their granular structure. Simultaneously with the destruction of chlorophyll starch formation ceases. The occurrence of oxidizing enzymes in plants appears to bear no direct relation to the destruction of chlorophyll under the influence of excessive amounts of manganese, and there seems to be no correlation between the phenomenon of chlorosis in pineapples and the activity of the oxidizing enzymes.

From ash analyses it was found that manganese was absorbed in considerable quantities, and that the ratio of absorbed lime to magnesia increased under the influence of manganese, regardless of whether the plant exhibited any toxic effects. The author believes that the effects of manganese are largely indirect and are to be explained on the basis of its bringing about a modification in the osmotic absorption of lime and magnesia. The toxic effects are chiefly due to this modification, rather than as a direct effect of the manganese itself.

Where small amounts of manganese occur in natural soils it is believed that a twofold function in plant growth is performed. The manganese acts catalytically, increasing the oxidations in the soil and accelerating the auto-oxidations in plants, and it tends to modify the absorption of lime and magnesia by partially replacing calcium from insoluble combinations and through a direct effect on the osmotic absorption of lime and magnesia.

The absorption of phosphoric acid by plants grown on manganiferous soil was found to be decreased, possibly due to the precipitation by the manganese of the phosphoric acid into a difficultly soluble compound.

The application of lime to manganiferous soils was found to result in a more intense yellowing. On the other hand, the application of soluble phosphates tends to ameliorate the effect of an excess of manganese. In practice this is the only means known to be efficacious, but in the case of pineapples it does not entirely prevent the development of the yellow color.

The form in which manganese is absorbed is not definitely known, but it is suggested that it is probably as a manganite of calcium.

**The influence of manganese on the growth of *Aspergillus niger*,** G. BERTHAUD and M. JAVILLIER (*Bul. Soc. Chim. France*, 4. ser., 11 (1912), No. 5, pp. 212-221).—In continuation of previous investigations by the authors on the effect of manganese, zinc, etc., on plants (*E. S. R.*, 25, p. 325), a study is reported on the action of manganese on the growth of *A. niger* in cultures, special efforts having been made to remove all traces of zinc, sulphur, etc., from the manganese. Varying proportions of manganese were added to Raulin culture media and the effect on the growth of the fungus was observed. The amount of manganese was varied from 1 part per million to 1 part in 50. In all the experiments there was found a stimulating effect that rapidly increased



with the concentration to an optimum, after which the growth was gradually reduced.

In a second series of experiments an attempt was made to determine the assimilation of manganese by the fungus. It was found that the increased weight of the mold was due not only to the manganese assimilated but also to the stimulating effect the chemical produced on the assimilation of other compounds by the fungus.

The amount of manganese fixed was found quite small in proportion to the total amount at the disposal of the plant, and it did not appear to be of physiological use within the cells. It either simply colored the cell wall or was changed into insoluble forms. The greatest stimulation to growth appeared when manganese was used in the proportions between 1 part to 10,000 and 1 part to 500. The manganese appeared to stimulate the production of conidia, as shown by differences in color of the growth on the media.

The stimulating action of manganese and copper sulphates on plants, L. MONTMARTINI (*Staz. Sper. Agr. Ital.*, 44 (1911), No. 7, pp. 564-571; *abs. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 2 (1911), No. 11-12, pp. 2467, 2468).—A study has been made of the effect of very dilute solutions of the sulphates of manganese and copper on the development, respiration, and photosynthesis of grapes, lupines, beans, and potatoes, and the flowers of *Leucanthemum* and *Ageratum*. Comparisons were drawn between the carbon dioxide liberated and the proportion of the different substances absorbed by the plants. The manganese solutions varied from 0.001 to 0.025 per cent and the copper sulphate from 0.005 to 0.05 per cent.

The results show that when these salts were absorbed by the plants in very small quantities both exerted a stimulating effect on the growth of all the plants. Marked differences were noted in the sensitiveness of the different plants, as shown by their respiration. Grapes were the most sensitive, followed by beans and potatoes in the order enumerated. The flowers of plants were found to exhibit more sensitiveness to the chemicals than the leaves. Unopened flowers were more sensitive than open ones. Photosynthesis was stimulated more than respiration, and it varied to some extent with the different plants.

The growth of wheat seedlings as affected by acid or alkaline conditions, J. F. BREAZEALE and J. A. LECLERC (*U. S. Dept. Agr., Bur. Chem. Bul.* 149, pp. 18, pls. 8).—A report is given of a physiological study to determine the effect of the reaction of the culture medium on the growth of wheat seedlings and particularly on the development of the root. Seedlings were grown in water cultures containing various amounts of sodium nitrate, potassium chlorid, potassium sulphate, hydrochloric acid, and sulphuric acid, singly and in combination with calcium carbonate. Two crops of seedlings were grown in the solutions, and the effect on germination was noted. Another series of experiments was conducted in which aluminum and ferric hydroxids were used to reduce the acidity of the solution, and still another series in which clover and timothy were grown in connection with wheat.

The investigations show that the seedlings grown in culture solutions containing potassium chlorid, potassium sulphate, or hydrochloric or sulphuric acid solutions (10 parts per million) exert a selective action whereby the potash ion is absorbed by the roots and the chlorid and sulphate ions are for the most part left in solution. This causes the solution to become acid, which in turn acts injuriously on the root development. The addition of iron or lime or aluminum hydrate to the media containing the other compounds used tended to keep the solutions alkaline so that they acted favorably on the root development.

New studies on narcosis in plants, O. RICHTER (*Mitt. Naturw. Ver. Univ. Wien*, 9 (1911), No. 1, pp. 14, 15; *abs. in Bot. Cenibl.*, 116 (1911), No. 24,

p. 616).—The author gives the results of his investigations on plants regarding the differences observable in chemical composition, etc., between plants exposed to an atmosphere of narcotics and those in air. These in the main may be summed up as follows: Plants in a narcotic atmosphere show (1) increase of soluble, osmotically active compounds, as sugar, asparagin, etc.; (2) heightened turgor; (3) cells growing in a form shorter but thicker with other cell modifications, as increase of collenchyma, epidermal thickenings, vacuolization and fusion of cells, etc.; (4) lessened synthesis of proteins and coloring matters; (5) alterations of negative geotropism; and (6) increase of heliotropic sensitiveness.

The stimulation of plants through small quantities of poisonous substances, E. B. FRED (*Centbl. Bakt. [etc.]*, 2. Abt., 31 (1911), No. 5-10, pp. 185-245, figs. 4; *abs. in Jour. Chem. Soc. [London]*, 100 (1911), No. 590, II, p. 1123).—A detailed account is given of experiments in which ether, carbon bisulphid, potassium bichromate, copper sulphate, and Salvarsan were tested on various organisms. It was found that their effect is a biological one and that when used in sufficient dilutions they promote the growth of *Azotobacter* and of denitrifying, ammonifying, and various putrefactive bacteria and yeasts.

Ether in a suitable quantity increased the nitrogen fixation by *Azotobacter* in soils, and both ether and carbon bisulphid increased nitrogen fixation in pure cultures, but not so much as in mixed cultures taken directly from soil. This is probably due to *Azotobacter*'s possessing a greater resistance to the chemical materials used than the other organisms; the energy which the second class of organisms would use thus goes to aid in the development of the more resistant forms. The growth of denitrifying bacteria was retarded through the presence of the antiseptics, although there was ultimately a small increase in total production. Denitrification, it is claimed, plays no important rôle in normal soil where there is no pronounced source of carbon present.

In ordinary soils nitrification was for a time retarded by the application of ether, but later it was considerably increased. The stimulating effect of ether and carbon bisulphid on the growth of plants in sterile soil was demonstrated.

In conclusion the author states that the beneficial effect of the substances tested is due to their stimulating action on the plants themselves as well as the effect they exert on the lower organisms.

An extensive bibliography is appended.

Action of carbon bisulphid on germinability of grain, A. MORETTINI (*Staz. Sper. Agr. Ital.*, 44 (1911), No. 5-6, pp. 417-422).—The author conducted a series of experiments to determine the injury to germinability of grain caused by the application of carbon bisulphid vapor for the purpose of combating injurious insects. Two lots of grain were employed, the germinability of which was from 90 to 100 per cent before treatment.

In a series of exposures to the vapor lasting from 1 to 60 days the germination decreased from 92 to 0.5 per cent for one kind of grain, and from 89 to 15 per cent for the second. Smaller quantities of the gas caused less injury. The smallest quantity that was effective as an insecticide was about 31.55 gm. of the poison per hectoliter of grain. This could be continued for 16 days without reducing the germinability below 98 per cent, and after 100 days it was not below 95 per cent. About 35.9 gm. per hectoliter is considered a safe proportion to employ for a period necessary to protect the grain.

The action of carbon bisulphid on the germination of wheat, P. FANTECHI (*Staz. Sper. Agr. Ital.*, 44 (1911), No. 7, pp. 515, 516).—Attention is called to experiments made by the author in 1900 upon the effect of carbon bisulphid on the germinability of wheat. He claims to have found that the vapor of carbon bisulphid as commonly used to destroy insects in stored grain did not

affect the germinative faculty of the grain. When seed were immersed for 2 seconds in carbon bisulphid and afterwards placed in the air, the germination of about 10 per cent was destroyed. Immersing seed for a minute and allowing them to remain in a vapor of carbon bisulphid for 24 hours destroyed about half of the seed. The action of the vapor was found to be greatly influenced by temperature, 30° C. causing a depreciation of at least 50 per cent in germination, and at 40° all seed were destroyed.

Treatment of seeds with hydrogen peroxid, E. MIDDÉ (*Gard. Chron.*, 3. ser., 50 (1911), No. 1292, p. 241; *Internat. Inst. Agr. (Rome)*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 2 (1911), No. 11-12, p. 2600).—A brief account is given of investigations which show that dilute solutions of hydrogen peroxid facilitated germination and stimulated the active development of plants.

The author concludes from his experiments that hydrogen peroxid is a useful fungicide for treating seed affected by smut. Immersion of infected seed for 15 minutes in a 1 per cent solution is said to have not only destroyed the adhering fungus spores but to have also protected seedlings against subsequent attack. It is thought that this fungicide might be efficient for the control of hollyhock rust.

Hydrocyanic acid formation in germination of seeds, C. RAVENNA and C. VECCHI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), II, No. 9, pp. 491-495).—This investigation follows up work previously noted (*E. S. R.*, 24, p. 229), experiments being carried on with seeds of flax and sorghum.

In flax seeds which normally contain a minute quantity of hydrocyanic acid the proportion was considerably increased on germination, and this increase was augmented upon the addition of 0.1 per cent of chlorid of ammonia to the water with which the seeds were moistened. In experiments with sorghum seeds, which in the quiescent state contain no prussic acid, this acid was produced by germination, and as before, its amount was augmented by the addition of sal ammoniac. In one experiment the addition of glucosé (0.2 per cent) gave a greater percentage of this acid than did sal ammoniac, while a still greater proportion was obtained by employment of both together in the percentages above mentioned.

Investigations on the germination of seeds of some weeds, O. MUNERATI and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital.*, 44 (1911), No. 1, pp. 40-50).—The effect of chemical and mechanical means of rendering seed coats of seed permeable was investigated. Different lots of seed of a number of common weeds were either immersed in strong sulphuric acid (specific gravity 1.84) or punctured with a needle opposite the embryo.

Among the so-called refractory seeds, soaking for from 15 to 90 minutes in sulphuric acid or puncturing the seed rendered the seed coats more permeable to water and hastened germination, though in some cases the total germinations of the untreated seed were the greatest. For the seed having thinner seed coats considerable injury followed the treatments. In a number of instances the germination of old seed was higher when treated with sulphuric acid than in the case of untreated lots.

Dependence of the respiration of plants on the lipids, E. STANEVICH (*Trudy Imp. S. Peterb. Obshch. Estestvo.* (Trav. Soc. Imp. Nat. St. Petersb.), 41 (1910), pp. 17-33; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 12 (1911), No. 1, p. 110).—The author examined the respiration of wheat germs after extraction with various solvents (*E. S. R.*, 25, p. 124). The quantities of carbon dioxide given off by 3 gm. of the embryos in 9 hours after the extractions were as follows: Control 163 mg., extracted with toluene 81.8 mg., acetone 79.8 mg., chloroform 61.4 mg., ether 48.0 mg., and alcohol 6.3 mg.,

showing a close relation between the extracted lipoids and the amount of carbon dioxide set free.

The fermentation of "hefanol" is more depressed by alcohol than by acetone.

Some recent investigations on the formation of starch in plant cells, A. GULLIERMOND (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 7, pp. 276-279, figs. 9).—It is claimed that a study of starch formation in potatoes, in the roots of *Phajus grandifolius*, and in other plants indicates a mitochondrial origin and that the leucoplasts of Schimper are identical with the chondriosomes of animals. Further studies are claimed to show that in plants starch is a direct result of the activity of the chondriosomes.

Glycogen in phanerogams and its relation to oxalate of lime, J. POLITIS (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), II, No. 8, pp. 431-439).—Studies were made on *Orchis morio*, *Bletia hyacinthina*, *Pitcairnia waihiocalyx*, and *Billbergia nutans*.

The author found glycogen to exist in several phanerogams, as well as in the few cryptogams in which it is asserted to be confined. The mucilage of the tubers of *Orchis* is asserted to be composed chiefly of glycogen. In the phanerogams examined by him glycogen was formed only in the cells containing oxalate of lime in the form of raphides, from which fact he infers some relation existing between the carbohydrate and the salt in question.

Origin and office of oxalate of lime in plants, J. POLITIS (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), II, No. 9, pp. 528-534).—This article, after summing up the conclusions of various other investigators bearing upon these points, gives the conclusions drawn from the author's own work briefly as follows: Oxalic acid, with its resulting calcium oxalate, has its origin in the cell in which the salt is found in crystalline form, and the acid is formed by oxidation of glycogen or amyloids.

The views of various others as to the office of the salt are given.

Essential oils and other volatile plant products as the cause of sap movements, I. GIGLIOLI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), II, No. 8, pp. 349-361; *abs. in Jour. Chem. Soc. [London]*, 102 (1912), No. 591, II, p. 79).—These investigations appear to be one phase of a more general study by the author of water movement in living tissues. Besides giving consideration to the work and reports of some others in the same field, he presents the results of his own researches with various volatile substances in regard to their influence on movement of water in the case of fruits, potatoes, fresh wood, etc.

It was found that in several cases, notably that of cactus in chloroform vapor, the movement of water from the plant and presumably through its interior tissue was considerably increased by the presence of a volatile body. The suggestion is made that such products in the plant tissues may be a more or less important modifying factor in transpiration and related processes.

Formation of alkaloids in tobacco, C. RAVENNA and V. BABINI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5. ser., 20 (1911), II, No. 8, pp. 393-398).—This is a report of investigations in close relation to those carried on by G. Ciamician and C. Ravenna (*E. S. R.*, 25, p. 634), M. Treub, and others cited. Tobacco plants in 5 groups were grown in nutritive solutions differing only as to the presence or absence of calcium nitrate (0.1 per cent) and of glucose (2 per cent), and under other conditions alike except as to the admission or exclusion of light.

It was found that the maximum percentage of nicotine in terms of the plant's original weight was obtained by the plant from the solution containing glucose in light; the minimum from the same solution in darkness. The difference is

ascribed to the arrest of the formation of the alkaloid when the plant is grown in darkness.

**Heliotropism in radium illumination**, H. MOLISCH (*Sitzber. K. Akad. Wiss. [Vienne], Math. Naturw. Kl.*, 120 (1911), I, No. 4, pp. 305-318, figs. 5; *abs. in Ztschr. Bot.*, 4 (1912), No. 2, p. 151).—This is a continuation of work taken up several years ago by the author on radium and heliotropism of plants (*E. S. R.*, 17, p. 752) in which only negative results were obtained, owing presumably to weakness of the radium preparation employed.

He now concludes that radium of strong illuminative power exposed at short distances is capable of producing in heliotropically very sensitive plants a positive tropism. This is true of the young seedlings of oats (*Avena sativa*) and vetch (*Vicia sativa*), but barley (*Hordeum vulgare*) and sunflower (*Helianthus annuus*) are not sufficiently sensitive to respond to radium illumination so far as tried. The  $\alpha$ ,  $\beta$ , and  $\gamma$  rays seem to check the longitudinal growth of the plants, also to shorten the period of spontaneous mutation, limit the synthesis of anthocyanin, and in some cases produce other injurious effects on plants which are very sensitive to its action.

**Investigations on Mucorineæ and their relations to soil**, O. HAGEM (*Vidensk. Selsk. Skr. [Christiania], Math. Naturv. Kl.*, 1910, No. 4, pp. 152; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 2 (1911), No. 11-12, pp. 2475-2477).—Studies by the author and others have shown about 30 species of Mucorineæ present in the soil and that they constitute an important element in the fungus flora of soils. Most of the species identified belong to the genera Mucor, Absidia, and Zygorhynchus. The distribution of the species seems to vary with different soils, those in cultivated soils differing from the species present in the soil of coniferous woods. While the relation of the Mucorineæ to mycorrhiza has not been established, it appears that there is a close relationship between the species present in the soil and those found occurring as mycorrhiza on roots. Both obligate and facultative parasites are found among these soil molds, but in most soils the facultative parasites predominate. Some species seem to be obligate parasites on higher fungi, as the agarics, and most of these belong to the genera Spinellus, Diceranophora, and Sporochinia.

The nitrogen, carbon dioxide, acid, and temperature relations of the different groups were studied. Only a few species were found to have any considerable effect on the nitrogen balance of soils through their action on nitrites and nitrates. Their importance, so far as the nitrogen balance is concerned, depends on the transformation of the ammoniacal nitrogen into a stable form which is useless to higher plants. The aminic and amidic nitrogen of the various organic substances in the soil is transformed by some of the species into ammoniacal nitrogen, a part of which is transferred into stable forms, while the other part circulates through the soil and can be utilized by higher plants.

The investigations showed that the Mucorineæ in general, and especially the soil forms, could not attack many carbon compounds, particularly cellulose and hemicellulose, although they could change various saccharin and pectin substances.

The temperature limits for the growth of most species lie between 7 and 33° C., with optima of from 20 to 25°.

An extended bibliography is given.

**The slime or gum of Rhizobium leguminosarum**, R. GREIG-SMITH (*Centbl. Bakt. [etc.]*, 2, Abt., 30 (1911), No. 21-24, pp. 552-556, fig. 1).—This is a short account of work, the results of which were previously published elsewhere (*E. S. R.*, 18, p. 1031). The author here describes briefly his methods of obtain-

ing and examining the gums and records some results which may be stated in substance as follows:

Five gums were obtained from five morphologically similar bacteria. They produced the same gums from sugar. There appears to be a probability that the plant tissues utilize the gum for building up their nucleoprotein. The location of the bacteria in the plant appears to have a distinct bearing upon their physiological activity. The optimum quantity of saline matter required for formation of slime is small, from 0.1 per cent to 0.2 per cent, approximating that found in soil water. *Rhizobium* is capable of fixing atmospheric nitrogen under conditions that favor slime formation, and between these two processes there appears to exist a somewhat regular quantitative relation.

The author was not able to confirm the view previously advanced by him that *Rhizobium* is a yeast. It appears to be a compound bacterium and consists of cocci contained in a straight or branching, tubular capsule. The cocci divide both transversely and longitudinally and the capsule, consequently, assumes sometimes a  $\gamma$  or Y form. The majority of the bacteria in a nodule are found to be dead.

#### FIELD CROPS.

[Field crops at the Hawaii Station], W. P. KELLEY, E. V. WILCOX, and C. K. MCCLELLAND (*Hawaii Sta. Rpt. 1911, pp. 9, 51-63, pls. 2*).—Earlier field crop work at this station has already been noted (E. S. R., 25, p. 328).

Cooperative fertilizer experiments with taro indicate "that this plant, like rice, is benefited by allowing the soil to dry out and become aerated between crops, by applying all of the fertilizer before planting rather than after planting or in fractional doses, and by using sulphate of ammonia rather than nitrate of soda as a source of nitrogen.

At Kunia and Waipahu applications of (1) dried blood, superphosphate, sulphate of potash, and lime, and (2) dried blood, dicalcic phosphate, and sulphate of potash were followed by higher average cotton yields during 1909-10 than were secured from the same components and nitrate of soda, ammonium sulphate, and basic slag in various mixtures. The fertilizers were so applied as to supply 20 lbs. of nitrogen, 50 lbs. of phosphoric acid, and 30 lbs. of potash per acre. From the data presented the author concludes that the soil is most in need of phosphates and that dicalcic phosphate appears more effective than other forms. Potash and nitrogen produced little effect unless applied with phosphates. Lime applied alone appeared ineffective.

When 2 crops of rice per year were grown the yields gradually decreased if fertilizer was applied to the spring crop only, but were maintained when ammonium sulphate was applied to each crop before planting. The superiority of the sulphate to nitrate of soda has been previously noted (E. S. R., 23, p. 41).

In a test of rice varieties newly imported from Japan the average yields from the spring crop of 1910 ranged in the following order: Omachi, Shinriki, No. 153 (old variety), Benkei, and Miyako, and tests in the fall of 1910 and spring of 1911 were in general conformity. Only Miyako was produced in sufficient quantity for a culinary test, and this is said to cook as well as imported Japanese rice and to hold its moisture as the Hawaiian rice does not. In taste and appearance, but not in oily strength, it is said to equal the native Japan rice. Two variations were noted in the growth of these rices. Benkei developed a heavy tillering habit which Shinriki appears to have lost, and Omachi, a bearded rice, became almost entirely beardless. If Omachi does not deteriorate it is believed to be the rice to grow in Hawaii.

In a cooperative test of cotton variation at Waipahu the following lint yields per acre were secured: Chinese upland 180.83, Egyptian 115, Sea Island 54.66, and Caravonica 25.37 lbs. The location appeared unfavorable, as only about 40 per cent of a stand was reported and the bollworm took about 30 per cent of that. The damage to the upland cotton was less than that suffered by the other varieties. In another test transplanted Caravonica seedlings gave better results than those not transplanted.

At the station Caravonica cotton yielded at the rate of 165.9 lbs. of lint per acre and produced fibers ranging from  $1\frac{1}{8}$  to  $1\frac{1}{4}$  in. in length. A brief progress report is given of date of pruning and pinching back tests, together with a statement of the theory on which these tests were conducted. The cotton was picked as it matured from the branches that had been pruned. Strength tests of the fibers showed that they had decreased from 8.99 gm. to 6.24 gm. in breaking strength. The more immature the fiber at pruning time the lower its breaking strength when tested. Individual plants yielded from 0.33 to 2.73 lbs. of lint per plant.

The use of a lantern placed above a pan of water and kerosene in the field at night and the regular cutting off and burning of infested bolls reduced the percentage of bollworm infestation from 68 per cent at the first picking to 50 per cent at the second and 26 per cent at the third picking.

Sea Island cotton yielded at the rate of 395 lbs. of lint per acre and produced fibers ranging from  $1\frac{1}{8}$  to  $1\frac{1}{4}$  in. in length in spite of a 20 per cent loss due to insects. Poisoned bran placed in small circles about the hills prevented damage from cutworms.

On December 31 the plants were pruned back to stumps, some high and some low. The growth invariably appeared near the ground, indicating that Sea Island cotton grown as a perennial should be pruned low.

Immature fiber picked from plants that had been pulled was found to contain a large amount of nep, immature fiber, and excessive waste. The yarn was too weak for thread.

A number of crops were planted for the purpose of determining their profitability in Hawaii. Peanuts did well and were in one case planted between cotton rows. Broom corn yielded at the rate of from 95.4 to 501.6 lbs. of brush per acre. Other crops tested were corn, saccharin and nonsaccharin sorghums, and a new legume called guar.

[Rotation and fertilizer tests], H. J. EUSTACE and V. M. SHOESMITH (*Michigan Sta. Rpt.* 1911, pp. 183, 184; 212-221).—This is mainly a report of tests begun in 1891.

During the first 5 years all plats were uniformly cropped to determine their relative fertility. Tables present data from which the author concludes that aside from the matter of profit a wheat-clover rotation is somewhat better in effect on soil fertility than a wheat-clover-corn or a wheat-clover-potato rotation, but the differences are not marked. Plats which had been continuously planted to wheat and corn were inferior in producing power to those on which clover had been grown in rotation. Beans grown each season with rye seeded in the fall and turned under in the spring were followed by 21 per cent greater yields than a continuous cultivation of corn and 29 per cent greater than was secured from the plat planted continuously to wheat. Continued cropping to orchard grass was followed by a 21 per cent greater yield than was a wheat-clover rotation. This is attributed to the heavy root system and the plant food which it stored.

In one series plats fallowed for 10 years produced more than any others of the series except those seeded to orchard grass, but when the averages of 2 series were considered fallow was excelled by a wheat-clover rotation.

A second portion of this long period experiment was devoted to tests of commercial fertilizer. The plats were planted in uniform croppings from 1891 to 1898. Tables state in detail the yields secured during 1899-1905. During this period stable manure, acid phosphate, nitrate of soda, muriate of potash, and a mixed commercial fertilizer were tested singly and in various mixtures for beets, potatoes, corn, oats, wheat, beans and turnips, but no conclusions are drawn.

The horticulturist reports better potato yields following a mixture of 194 lbs. of nitrate of soda, 357 lbs. dried blood, 1,000 lbs. of acid phosphate, 400 lbs. of sulphate of potash, and 49 lbs. of filler applied at the rate of 500 lbs. per acre than were secured from the use of a complete potato fertilizer or a mixture of 570 lbs. of dried blood, 1,000 lbs. of acid phosphate, 400 lbs. sulphate of potash, and 30 lbs. of filler.

Cooperative grain investigations at McPherson, Kans., 1904-1909, V. L. CORY (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 240, pp. 22*).—This is a report of work carried on in cooperation with the Kansas Station.

Among the winter wheat varieties tested Turkey, Kharkof, and Crimean produced the highest 4-year-average yields, 25.9, 24.53, and 23.88 bu. per acre, respectively. Three varieties planted about the middle of September, 1905, gave an average yield of 7.78 bu. per acre as compared with 20.46 bu. secured from the same varieties planted about a month later.

Among barley varieties tested Caucasian, Yenidje, and Odessa produced the highest 4-year average yields, 30.32, 28.57, and 28 bu. per acre, respectively. Among varieties of oats tested Sixty Day and Seventy-five Day gave 4-year average yields of 37.56 and 36.54 bu. per acre, respectively. Among the other grains tested Proso proved a failure in all trials, but a few varieties of non-irrigated rice were promising. Kubanka wheat gave a 4-year average yield of 13.43 bu., Black Winter emmer 52.16 bu., winter einkorn 19.85 bu., spring einkorn 22.8 bu., and Red Winter spelt 46.8 bu. per acre. Each of 3 winter ryes tested yielded 19 bu. or over per acre.

Buckwheat gave fair results, the Sando Soba variety of the Japanese type apparently being the best of the 12 or 15 varieties tested. Chinese buckwheats are hardier and more drought resistant but longer in maturing. Plantings during the third and fourth weeks of April gave better results than those made at earlier or later dates.

The author states that the suspension of seed for 15 minutes in a solution of 1 lb. of formalin to 50 gal. of water will prevent oat smut, the stinking smut of wheat, and the covered smut of barley, but caused no appreciable diminution in the loose smuts of wheat or barley. A modified hot-water treatment used was applied by soaking wheat and barley in cold water for 7 hours and then treating for 15 minutes at 51 and 52° C. respectively, and 10 minutes treatment of oats at 57° without soaking. In the crop following these treatments there was no smut in the oats, no loose smut in the wheat, and in case of the barley only a trace of loose smut in 3 varieties.

Studies of the principal buckwheat species, E. MÈGE (*Recherches sur les principales espèces de Fagopyrum. Paris, 1910, vol. 1, pp. 426; rev. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 5, pp. 1054, 1055*).—This volume presents a comprehensive study of buckwheat species and varieties. The author gives measurements and 1,000-kernel weights for use in distinguishing the 4 species *Fagopyrum esculentum*, *F. tataricum*, *F. stenocarpum*, and *F. emarginatum*, and for distinguishing 6 varieties of *F. esculentum*. A review of the status of buckwheat growing in the world's agriculture is followed by discussions as to the production and improvement of the crop.



The condition of Kansas seed corn, E. G. SCHAFER (*Kansas Sta. Circ. 22, pp. 3*).—After a long dry period in the summer of 1911 more favorable conditions came in the fall. Corn renewed its growth and at the time of the early freezes contained a high percentage of moisture. Among thousands of ears of seed corn received from farmers in different parts of Kansas, the station's average test has been "about 75 per cent good." In view of these facts this circular gives suggestions on the purchase of seed corn, the germination test, the individual ear test, and the preparation of land for planting.

The seed corn situation, C. G. WILLIAMS (*Ohio Sta. Circ. 121, pp. 117-120*).—A discussion of the advantages of testing is followed by directions for the use of the germination test of seed corn.

Some data for oat growers, L. C. BURNETT (*Iowa Sta. Bul. 128, pp. 93-127, figs. 5*).—Earlier oat experiments have already been noted (E. S. R., 19, p. 1934).

A key to oat varieties based upon the work of J. B. Norton and a classification of oats for shows precede tables reporting the results of tests of 48 commercial oat varieties as to date of ripening, height, percentage of lodging, the yield per acre, and the weight per bushel during 1908, 1909, and 1910. Averages for this period, for the 5-year period 1906-1910, and the 7-year period 1904-1910 are given where possible. Among 7 common Iowa varieties, Kherson gave a 7-years' average yield of 55.9 bu. per acre, or 7.5 bu. more than the average of the standard varieties, and was excelled in early ripening qualities only by the Early Champion and White Alaska. Silver Mine averaged 52.8 bu. per acre but averaged about 8 days later in ripening.

Iowa's 1907 oat crop showed very light weight per bushel and yield. The heaviest and best seed obtainable of 20 leading varieties was purchased from outside sources for comparison with the light home-grown seed during 1908. The average results are indicated by the following figures, the data for the home-grown seed being stated first: Weight of seed per bushel as sown 25½ and 33 lbs., number of seeds sown per acre 2,443,000 and 1,829,000, leaf-rust 16.7 and 18.9 per cent, stem rust 23.7 and 26.8 per cent, lodging 11 and 16 per cent, yield per acre 31.2 and 31.5 bu., weight of crop per bushel 22.1 and 22.2 lbs. The average date of sowing was April 19, and the average date of ripening July 25. All plats were sown at the rate of 3 bu. per acre. In case of 12 varieties the light acclimated seed outyielded the heavy imported seed, in 7 cases the heavy seed outyielded the light, and in one case the yields were equal. "Some of the plats with heavy seed may have been underseeded. The figures tend to show that the heavy seed and light seed were about equal pound for pound, but not seed for seed, nor measure for measure."

Six bu. of Kherson and Silver Mine oats were taken just as they came from the thrashing machine and divided into 4 samples of each variety, a check sample and samples fanned 1, 2, and 3 times each, respectively. Each fanned sample was again divided and used in sowing so that each of 4 plats of each variety received the same number of pounds of seed, while other plats were given the same number of seeds, as nearly as the drill could be calibrated to accomplish this result. In 9 different tests the unfanned oats never excelled the fanned samples in yield, but the samples fanned 3 times rarely yielded more than those fanned once or twice.

A Wyoming-grown sample of oats of Irish Victor stock, which won the championship at the Portland Exposition, was sown in 1907 and 3 succeeding years for comparison with other Irish Victor seed. In the 4 years it never equaled the parent stock, but approached it at a rate which if continued in the future would make it equal the older stock within 2 more seasons. In 1907 new varieties were purchased, which showed such variations that the seed of each variety

was retained each season for further sowing as a separate variety, for example, Probesteler 1907, Probesteler 1908, etc., indicating the first season in which the variety was grown at Ames from the stock so designated. Tables present the economic portion of the notes taken on this test of seed of different degrees of acclimatization. Another table compares the first, second, and third crops after importation of the seed obtained from the British Isles and various stations. The author notes that the British seed, the normal date of ripening of which is late in August was damaged less and less in each succeeding generation by the changed conditions, consequently the second crop exceeded the first and was exceeded by the third in yield. Seed from central Illinois yielded 52.6, 52.7, and 52.2 bu. per acre for the 3 crops. The small rise in the second crop is so frequent as to be important, in the author's opinion, although its frequency is less than 50 per cent. He concludes that "short-seasoned territories produce oats better adapted to a longer-seasoned territory than the ones usually grown there," but that "as a whole the imported seed is not better than the average home-grown seed."

Although the seed sold under a given name does not conform to a single type of plant, or always contain a limited number of types in the same proportion, it is stated that "at the Iowa Station it is not considered that this point seriously affects yield or weight per bushel." In 1910 only 4 of 19 new importations yielded as well as the same varieties that had been acclimated for 1 or 2 years. The loss in yielding power appeared to be directly proportional to the degree of change of environment. The increase in yield was most marked in the second crop, and quality of seed appeared less important than acclimatization. Where importations appeared successful the increase arose from securing a better adapted variety rather than from the quality of seed.

In 4 years' tests drilling and broadcasting gave average yields of 40.7 and 36.9 bu. per acre, respectively, and wherever the land is dry enough to permit, drilling is recommended.

A table states the results of a 6-years' test of rates of seeding Kherson and Silver Mine oats. During the 4-year period 1908-1911 Kherson yielded more heavily after seeding at the rate of 4½ bu. per acre than at any lighter rate, but Silver Mine sown at the rate of 4 bu. per acre yielded much more heavily than any higher or lower rate tested.

The Chicago grades of oats are stated and suggestions made as to needed improvements in methods of oat production in Iowa.

Composition of oats as affected by fertilization, hilling, and rate of seeding. W. EBERT (*Mitt. Landw. Inst. Leipzig, 1911, No. 10, pp. 3-83*).—The author reviews the literature of the subject, with frequent citations and a bibliography of 123 titles, and from a considerable amount of data, gathered in his own tests, he draws the following conclusions:

Variation in rate of sowing influences the composition of oats more than does variation in any other cultural practice tested. Thin sowing increases root development, tillering, length of panicle, number of spikelets, and weight per panicle and per 1,000 kernels, and reduces the chaff percentage. Both grain and straw are increased in dry substance and protein content, the chaff is increased in dry substance and varies in protein content, and ether extract and crude fiber decrease.

Fertilization showed the next greatest influence, producing an increased root development, tillering power, length of straw, length and weight of internode, length and weight of panicle, number of spikelets, and whorls, and 1,000-kernel weight, and reducing the chaff percentage. It apparently increased the protein

content of straw and chaff and the dry matter content of the grain, but reduced the ether extract and crude fiber in the grain.

Hilling increased root development, but gave no corresponding increase of tillering power. It increased the weight per haulm and per internode, but showed varying results as to length of both. With some exceptions it lengthened the panicle and the number of whorls. It increased the 1,000-kernel weight, chaff percentage, crude fiber of the grain, and the protein percentage of the straw. As the hilled plots fell below the unhilled in both gross and net income, the author concludes that hilling is valueless, but notes that these results may be attributed to the fact that the condition of the soil prevented hilling at the proper time.

**Rice**—A possible new industry for California, G. W. SHAW and A. J. GAUMNITZ (*California Sta. Circ. 74, pp. 26, figs. 7*).—This circular reports studies made in order that inquiries as to the possibility of developing the rice industry in California might be intelligently answered. General discussions of rice culture and its soil requirements and directions for the production of the crop are followed by tables and descriptive text stating the results of variety and irrigation tests on a number of California farms.

Analyses of water from a spot where rice was growing satisfactorily and from another where it appeared to be seriously affected by the alkali gave the following results, the first percentage in each case being that for the water which was apparently producing injurious effects: Total soluble salts, 0.6806 and 0.0912; chlorids, 0.1160 and 0.035; carbonates, 0.1017 and 0.0042; and sulphates, 0.4719 and 0.052 per cent.

In a depth of water test the ground was kept thoroughly wet from April 1 to May 10. Water was then kept 1 in. deep from May 11 to May 24, and varied in depth from 1 to 6 in. on different areas from May 25 to August 27. From the data reported the author concludes that "the indications are quite strong that the maximum quantity of water on the adobe soil should not exceed 4 in. in depth and that not less than 2 in. should be used."

Analyses made by B. A. Madson showed the composition of composite samples of California-grown rice of the Japanese and Honduras types to be, respectively, water 9.62 and 9.72, protein 10.06 and 11.4, fat 2.57 and 2.51, ash 1.9 and 1.61, crude fiber 1.24 and 1.17, and carbohydrates 84.23 and 83.31 per cent. It is concluded that the food value of the California-grown sample is as high as that of the southern-grown product.

Other tables state the amount of plant food removed by wheat and rice, the labor cost of growing rice in various counties, and the duty of centrifugal pumps for lifting irrigating water less than 35 ft.

In a variety test at Biggs in 1909 an average yield of 3,486 lbs. per acre was secured from plots varying in size from one-fortieth to one-tenth of an acre. In 1910 an average yield of 7,089 lbs. per acre was secured from small plantings, while an average yield of 3,820 lbs. per acre was secured from another series of plots ranging from 0.25 to 13.51 acres in size.

"From all data obtainable it appears that California may ultimately be producing large quantities of this valuable food product." The authors regard the outlook for the industry as exceedingly encouraging, but state that this publication "distinctly does not wish to urge engaging in the industry in a large way until more is learned concerning it."

**Soy beans as a supplementary silage crop**, E. R. MINNS (*New York Cornell Sta. Bul. 310, pp. 259-274, figs. 6*).—Directions for growing soy beans in New York are followed by reports of the results of tests, mainly conducted by farmers, some of whom cooperated with the experiment station in their test.

On a farm at Milbrook, N. Y., 4 acres of a planting of 4 kernels of corn and 6 soy beans per hill planted by hand in hills 36 by 40 in. apart yielded in 1905 72 tons of fodder. The ratio of corn fodder to soy-bean fodder, by weight, in the mixture was estimated at 5:1. The next year a mixture of 4 or 5 grains of corn to 10 or 12 soy beans per hill gave a crop in which the ratio was slightly less. During the following March the silage contained 4.22 per cent of protein and 2.2 per cent crude fat. During 1907 corn made a poor growth and the proportion of corn to soy-bean fodder based on the weight of 12 hills was 2:1. The silage showed higher percentages of solids, protein, fat, and carbohydrates than did ordinary corn silage, and its nutritive ratio was 1:6.75.

During the next 2 years hand planting was supplanted by mixing the beans and corn in equal quantities, and sowing with a grain drill at the rate of 20 qts. of the mixture per acre in rows 3½ ft. apart. Although droughts interfered in 1911, 12½ tons of fodder per acre were secured from a field below the average in productiveness. In the same neighborhood another farmer planted 16 acres in 15 hours with a corn planter which dropped from 4 to 6 kernels of corn and from 8 to 10 beans in the same hill from separate boxes and also distributed fertilizer. A yield of from 12 to 15 tons per acre followed this planting.

In another case every third row was devoted entirely to beans and the binder was driven across the rows containing only beans. Of the mixture, 19 per cent was soy beans as compared with 11½ per cent from the rows which had been planted at the rate of 5 or 6 kernels of corn and from 8 to 12 beans per hill.

A few farmers reported the hand planting of soy beans between corn hills, or very close to them "crosswise of the first cultivation." Frequently the beans failed because of dry weather, or the advancement of the corn, and the plan succeeded only under favorable conditions. Cooperative tests of mixed plantings in 3 localities in 1908, 5 in 1909, and 4 in 1910 are reported showing an apparent decrease in the growth of corn due to the mixture, but no conclusions are drawn. In 3 years' tests of mixed planting at the University farm, corn alone gave a slightly higher total yield per acre, but analyses showed a lower percentage of protein and ether extract than did the mixed fodder.

Although the author states that he "has failed to prove the real value of soy beans grown in corn fields for silage in the experiments just described," he presents statements from a number of farmers, some of whom have practiced such mixed planting and appear to regard it as decidedly advantageous.

**Report on field trials with varieties of swedes in the year 1910.** E. HARRISON and E. E. STOKES (*Midland Agr. and Dairy Col. Bul. 6, 1910-11, pp. 35-41*).—This is a report of a variety test of swedes conducted during 1910, including data as to the yield and dry matter percentages of the varieties tested in 5 different localities. In amount of dry matter produced per acre, Golden Melon stood first, Magnum Bonum second, and Extra Improved Purple Top third.

**The adulteration and misbranding of the seeds of red clover, Kentucky blue grass, orchard grass, and hairy vetch.** B. T. GALLOWAY (*U. S. Dept. Agr., Office Secretary Circ. 39, pp. 7*).—In continuation of the seed inspection of 1910 (*E. S. R., 25, p. 237*), 1,548 samples of seed were examined in 1911, of which 250 were found to be adulterated or misbranded.

Of 305 samples obtained as orchard grass, 28 were adulterated with the seed of meadow fescue, rye grass, or other seeds. Of 430 samples obtained as Kentucky blue grass, 35 were wholly or in part the seed of Canada blue grass or other grasses. None of the 510 samples of red clover seed secured were found to be adulterated or misbranded. Of 303 samples secured as hairy or sand vetch, 187 were found to be adulterated or misbranded, 5 were spring vetch

and contained no hairy vetch seed, while others contained varying amounts of spring and other vetches. Most of the hairy vetch seed used in the United States is imported, but an examination of the seed-producing region of Germany and the Baltic Provinces of Russia does not indicate that hairy vetch is harvested with the seed of the cultivated forms of spring vetch.

Seed tests made at the station during 1911, G. T. FRENCH (*New York State Sta. Bul.* 345, pp. 42-58).—A continuation of the tests made at this station during 1910 (E. S. R., 24, p. 736), including 548 alfalfa, 253 red clover, 98 timothy, 86 alsike, and 30 miscellaneous seed samples. ●

Dodder occurred in 12.9 per cent of the alfalfa samples, and in 4.74 per cent of the red clover samples. Large seeded dodder occurred in twice as many samples as did small seeded dodder. Noxious weed seed was a little more frequent in occurrence in red and alsike clover than in 1910. Observations indicated that several cases of alsike adulteration with yellow trefoil resulted from the presence of trefoil in the field. *Centaurea repens* was again found in several alfalfa seed samples, indicating the importation of seed. Russian thistle and roquette continued to attract attention in alfalfa fields but without indication of being dangerous.

Chemical tests of 4 samples of sulphur-bleached oats indicated the presence of sulphuric acid in large quantities, while germination tests showed none viable in 2 cases, 14 per cent in 1 case and 1 per cent in another.

Quality of farm seeds in 1911, F. H. HALL (*New York State Sta. Bul.* 345, popular ed., pp. 4).—This is a popular edition of the above.

Methods of keeping crop records at the Michigan Station, F. A. SPRAGG (*Michigan Sta. Rpt.* 1911, pp. 193-211, figs. 15).—This is a paper presented at the November, 1910, meeting of the American Society of Agronomy. It presents blank pages from an accession number book, oat and alfalfa breeding registers, and individual alfalfa and clover registers. The keeping of records and the use of stakes, labels, platting systems, and progeny numbers are explained.

## HORTICULTURE.

Report of the horticulturist, J. E. HIGGINS (*Hawaii Sta. Rpt.* 1911, pp. 25-42, pls. 5).—Studies of various phases of avocado production were continued during the year. The results have been reported quite fully in a recent bulletin of the station (E. S. R., 26, p. 441).

The papaya investigations were continued, the work including breeding, pruning, thinning, and shipping experiments. It has been found possible to propagate papayas by using monœcious trees without the help of sterile male trees (E. S. R., 25, p. 337). A number of successful crosses are here discussed. Perfect monœcious flowers have been successfully self-fertilized and pollen from such flowers was successfully used on pistillate dioecious flowers and on perfect or hermaphrodite flowers occurring on staminate dioecious trees. The latter flowers can also be fertilized by their own pollen and by the pollen from staminate flowers on similar trees. The pollen of staminate monœcious flowers applied to pistillate dioecious flowers has thus far proved unsuccessful. The breeding work will be continued to perpetuate, if possible, the monœcious character of certain members of the first generation seedlings and at the same time combine with this character desirable characters of the dioecious papaya.

One papaya tree growing on the station grounds was devoid of seeds in all the fruits examined. Some of the flowers were hand pollinated with pollen from staminate flowers of the dioecious type, others were sealed in paraffin sacks several days before opening to prevent pollination by natural means. All of the flowers developed full grown papayas. Similar results were secured

with protected flowers on some other trees, the resulting fruit in addition to being seedless was somewhat smaller than the fruits from fertilized ovaries. These results as a whole lead to the conclusion that pollination is not always necessary for the production of fruit in the papaya and that seedlessness in case of the first noted tree, at least, is probably not due to a lack of pollination. Pruning experiments with the papaya indicate that larger sized fruit is secured by removing the branches and encouraging fruit production along the main trunk. Thinning the fruit on certain trees which tend to overbear was likewise of considerable value. Recent trial shipments of papayas to San Francisco indicate that, with proper attention to selection of varieties possessing shipping qualities and to careful handling and packing, papayas may be successfully marketed in the United States as soon as a demand is created for the fruit.

Considerable trouble has been experienced with the Bluefields banana in Hawaii because the pseudostems break off and let the bunches fall. This appears to be due to a number of contributory causes, such as close planting and lack of pruning, thereby promoting weak stem growth. Furthermore, the bunches are allowed to remain on the plants until they become too heavy. In order to lessen decay in transit, bananas grown for export should be removed from the plant some time before the bunch has attained its full growth. The so-called Hamakua banana regarded by some as identical with Bluefields was determined as distinct from Bluefields but resembling it sufficiently to be marketed as Bluefields.

With the exception of spraying experiments (E. S. R., 26, p. 441) little new work has been undertaken with mangoes. One of the new varieties to come into bearing, the Brindabani, appears to be valuable for its heavy and early bearing habits. It has borne mature fruit 18 months after being grafted. The Brindabani and the Oahu, a large fine mango bearing fruit of good quality, are described. The method of making fruit models used at the station as a means of record in the study of mango varieties is here described in detail.

The citrus orchards have been extended somewhat during the year. A list is given of the citrus varieties now growing on the station grounds, together with information relative to accessions and distributions and a note on propagating hibiscus.

**Report of the South Haven substation, F. W. WILKEN (*Michigan Sta. Rpt.* 1911, pp. 184-186).**—A brief report for the year ended June 30, 1911.

Variety tests of strawberries have been discontinued because the soil on the station property is not considered desirable for strawberry culture. Extensive tests of the comparative value of Bordeaux mixture, self-boiled lime-sulphur, and commercial diluted lime-sulphur on apple, peach, pear, plum, and cherry trees were started in the spring of 1911. In order to make extensive tests of lime-sulphur as a summer spray, the usual Bordeaux mixture was replaced in the general spraying by a concentrated commercial preparation, used at the rate of 1 gal. to 49 gal. of water to which was added 2 lbs. of arsenate of lead. This mixture as used on some 400 varieties of tree and small fruits, but not including strawberries, was satisfactory.

Scab on the Flemish Beauty pear and rot on the Victoria plum, which has not been successfully checked by Bordeaux mixture in previous years, were almost entirely controlled by lime-sulphur. Grape black rot was not well controlled by lime-sulphur nor was the foliage helped. Lime-sulphur at the rate of 1 gal. to 74 gal. of water was satisfactory in preventing plum rot. It can be used nearer to the picking time than Bordeaux since the stain does not show on the fruit.

A list is given of new or little known varieties of apples which produced good crops. Of these Winter Banana and Fameuse Sucre have proved of special merit.

The horticultural industries in Germany (*Gartenflora*, 60 (1911), Nos. 19, pp. 409-426; 22, pp. 491-499; 24, pp. 522-527).—A statistical review of the private, communal, and commercial horticultural industries in the various provinces of Germany.

List of secretaries of state and other horticultural societies (*Rpt. Va. State Hort. Soc.*, 16 (1911), pp. 326, 327).—This list, which includes the secretaries of state and other horticultural societies in the United States and Canada, has been compiled under the direction of the Minnesota State Horticultural Society and corrected to the end of 1911.

The profitable culture of vegetables, T. SMITH (*London, New York, Calcutta*, 1911, pp. XV+452, figs. 172).—A handbook for the market gardener and others dealing with both ordinary and French gardening methods.

List of publications important to fruit growers, J. P. STEWART (*Penn. Dept. Agr. Bul.* 215, 1911, pp. 33).—This list is prepared primarily to meet the needs of those actively engaged in fruit growing. It is based largely upon recent publications of various agricultural experiment stations and of the U. S. Department of Agriculture and also includes important books, periodicals, reports of horticultural organizations, etc.

The arrangement is both by topics relating to various phases of orcharding and by specific kinds of fruits.

[Orchard cover crops], H. J. EUSTACE (*Michigan Sta. Rpt.* 1911, pp. 181, 182).—In some cover crop and fertilizer tests being conducted by the Michigan Station in a number of vineyards and orchards, winter vetch sown about August at the rate of from 25 to 30 lbs. per acre has thus far proved the most satisfactory.

Profitable crops for the young orchard, H. L. PRICE (*Rpt. Va. State Hort. Soc.*, 16 (1911), pp. 181-195).—A discussion of orchard cropping practices in Virginia, including a summary of data secured relative to this subject.

Methods and implements in orchard cultivation, H. A. SURFACE (*Rpt. Va. State Hort. Soc.*, 16 (1911), pp. 33-53, pl. 1).—A paper on this subject with the discussion following.

Spraying practice for orchard and garden, S. A. BEACH (*Iowa Sta. Bul.* 127, pp. 49-86, figs. 9).—This bulletin describes methods of combating the more common insect pests and plant diseases which infest Iowa orchards and gardens, special attention being given to the apple. The directions have been prepared to conform with the present knowledge of spraying, being based both on the work of scientific investigators and the experience of practical fruit growers.

The present status of varieties in commercial orchards, A. W. DRINKARD, Jr. (*Rpt. Va. State Hort. Soc.*, 16 (1911), pp. 110-120, pls. 2).—This article summarizes the data relative to varieties secured by the author in connection with an orchard survey of Virginia, a full report of which is to appear later.

Tabular data are given showing the relative rank of varieties in commercial orchards, and comparing the leading varieties in bearing orchards, young orchards, and prospective orchards. York holds first rank in all classes of orchards, both as regards the number of orchards in which it is found and also the number of trees planted. Winesap holds second place in the bearing orchards, and third place in the young orchards and in the prospective orchards. Although Ben Davis is third in the bearing orchards, it is only eighth in the young orchards and ninth in the prospective orchards. The other leading varieties are Albemarle, Stayman Winesap, Mammoth Black Twig, Grimes, Rome, and Black Ben Davis.

On vegetable forcing with special reference to the etherization of strawberries, G. BULTEL (*Jour. Soc. Nat. Hort. France*, 4. ser., 13 (1912), Apr., pp. 218-217).—In support of his previous investigations (E. S. R., 19, p. 144), the author found in tests conducted in 1911 that strawberry plants submitted to ether vapor came into bearing about 2 weeks earlier than untreated plants.

Grape stocks best suited for dry and limy soils, N. GARCÍA DE LOS SALMONES (*Prog. Agr. y Pecuario*, 17 (1911), Nos. 726, pp. 330-332; 727, pp. 346-348; 728, pp. 361-364; 729, pp. 379, 380; 730, p. 396; 731, pp. 410-412).—A paper on this subject prepared with special reference to Spanish conditions and based upon various papers read before the International Congress of Agriculture.

Hot room callusing, F. T. BIOLETTI and L. BONNET (*California Sta. Circ.* 76, pp. 12, figs. 6).—In a previous bulletin of the station a method of callusing grape cuttings in beds of sand was described (E. S. R., 18, p. 549). The sand callusing bed, however, has been found to have many defects and inconveniences, most of which can be overcome by stratifying the cuttings in boxes of moss and callusing in a hot room. The hot room method, which has been adopted in California by all of the large producers of grafted vines, is here discussed in detail under the following headings: Methods of grafting, graft trays, callusing boxes, callusing materials, filling the boxes, the hot room, temperature, moisture, aeration, removal from the hot room, hardening, and planting.

Investigations on the practice of heading-in grapes, L. RAVAZ (*Ann. École Nat. Agr. Montpellier*, n. ser., 11 (1912), No. 4, pp. 285-323, figs. 7).—The author reviews the literature of the subject and gives an account of his investigations conducted for a number of years at the Montpellier Agricultural School.

Summarizing the results it appears that the practice of heading-in, if employed shortly after the flowering season, tends to increase production, but at the expense of quality.

Grape culture in Pennsylvania, W. H. SILL (*Penn. Dept. Agr. Bul.* 217, 1912, pp. 66, pls. 51).—A practical treatise, superseding Bulletin 128 of the same series (E. S. R., 16, p. 976), on commercial grape growing, discussing the extent and history of the grape industry, and the location, details of production, and business management of a vineyard.

Contribution to the study of olive varieties, J. RUBY (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 3, pp. 299-316).—A classification of the related varieties of olives growing in France, based upon the shape of the fruit. The important characteristics of each variety are indicated, together with its common name, cultural region, and composition of pulp.

Protecting the California orange crop from frost, A. G. MCADIE (*Mo. Weather Rev.*, 39 (1911), No. 12, pp. 1910-1912).—The author reviews the conditions prevailing in California during the frost period of December, 1911, compares the results with those of previous years, and cites examples in which citrus orchards were successfully protected from frost damage by the use of smudges and orchard heaters.

Keeping quality of citrus fruit treated to eliminate frosted fruit, C. W. MANN (*Cal. Cult.*, 38 (1912), No. 19, pp. 582, 599, 607).—A review of the results secured in a number of California packing houses in the use of distillate or kerosene oil and of alcohol in separating frosted citrus fruit from sound fruit.

The alcohol method has proved the most satisfactory, the fruit being uninjured by the treatment, except where the skin has been previously punctured or broken. The use of distillate in the treatment of oranges generally shows a bad effect on the flavor of the fruit and results in an increased percentage of rot.

Alcohol for separation of frosted fruit, D. C. LEFFERTS (*Cal. Cult.*, 38 (1912), No. 19, pp. 583, 584).—The author reports progress during the past



season in the use of an alcohol bath for the separation of frosted oranges from sound fruit (E. S. R., 22, p. 737). The results to date indicate that in certain cases the specific gravity of good fruit may be sufficiently variable as to cause difficulty in the use of the bath.

**Fruit drying**, W. J. ALLEN (*Dept. Agr. N. S. Wales, Farmers' Bul.* 52, 1911, pp. 22, figs. 17).—A popular treatise on methods of drying apricots, peaches, nectarines, prunes, figs, apples, pears, and raisin and currant grapes, including a description of the necessary equipment.

**Morphologic-physiologic investigations of the flowers of coffee species**, F. C. VON FABER (*Ann. Jard. Bot. Buitenzorg*, 2, ser., 10 (1912), pt. 1, pp. 59-160, pls. 12).—This is a contribution to the knowledge of the physiology of the coffee plant, based partly on material secured from the author's experimental garden and partly on material from the Buitenzorg Botanical Garden. The subject matter is presented under the following general headings: Development processes, morphology and cytology of the coffee flower; fructification; processes subsequent to fructification; abnormalities in development; experimental investigations on the pollination and fructification of coffee species; physiological investigations of pollen grains; a partial sterility of coffees; the occurrence of small constant sterile flowers in various coffee species; general considerations on sterility; the cause of sterility in coffee; and experimental tests on the influence of exterior factors on the formation of sexual organs in *Coffea liberica*, *C. arabica*, and Kalimas hybrid, a supposed hybrid of these species.

**Coffee culture**, O. TELLEZ (*Bol. Dir. Gen. Agr. [Mexico]*, *Rev. Agr.*, 1 (1911), Nos. 4, pp. 287-308, pls. 2; 5, pp. 391-407, pls. 4; 6, pp. 502-519, pls. 4).—A popular treatise on the establishment, culture, and management of a coffee plantation.

**Fertilizer experiments with coffee**, G. HELMEICH (*Bol. Dir. Gen. Agr. [Mexico]*, *Rev. Agr.*, 1 (1911), Nos. 1, pp. 7-26, pls. 2; 2, pp. 104-120, pls. 8).—The results of several years experiments in the use of artificial fertilizers on some coffee plantations in Mexico are reported.

**The coco palm and its culture**, P. PRÆUSS (*Die Kokospalme und ihre Kultur*. Berlin, [1911], pp. VII+221, pls. 17, figs. 21; rev. in *Naturw. Rundschau*, 27 (1912), No. 16, pp. 206, 207).—This is a practical treatise on the botany, uses, culture, insect pests, and diseases of the coconut palm (*Cocos nucifera*), including also information relative to preparation and marketing of the products and statistics of production and commerce.

A bibliography is appended.

**Roses**, H. R. DARLINGTON (*London and Edinburgh*, [1911], pp. XII+193, pls. 8).—In addition to cultural details, selections and descriptions are given of various kinds of exhibition, garden, and climbing roses, together with a calendar of operations for each month of the year.

A bibliography on roses is appended.

**Planning and adorning the farmstead** (*Iowa Sta. Bul.* 126, pp. 23-44, figs. 15).—This bulletin comprises 2 articles which relate to the planning and development of the farmstead, both from the standpoint of convenience and of securing an attractive landscape effect.

**Planning and adorning the farmstead**, A. T. Erwin (pp. 23-37).—Suggestions are given for the location of buildings, drives, walks, trees, shrubbery, lawn making, etc. A selected list of trees, shrubs, vines, etc., is given.

**Planning the farm in relation to the farmstead**, J. B. Davidson (pp. 38-41).—The author here presents a number of principles which should be considered in planning the farm for convenience, together with plans showing a good arrangement and a poor arrangement of farm buildings.

## FORESTRY.

A classification for forestry literature (*Yale Forest School Bul. 1, 1912, pp. 6*).—This classification has been prepared by the faculty of the Yale Forest School to supply the demand for a simple and comprehensive classification adapted to any library system. The general divisions are as follows: General works, forest botany, silviculture, forest protection, lumbering, forest management, forest technology, history and statistics, forest influences, and forest policy.

Annual progress report of forest administration in the Western and Eastern Circles of the United Provinces for the forest year, 1910-11, B. B. OSMASTON and J. S. CAMPBELL (*Ann. Rpt. Forest Adm. West. and East. Circles [India], 1910-11, pp. 18+8+18+XCIX+2*).—This is the usual report relative to the constitution, management, and exploitation of the state forests in the Western and Eastern Circles of the United Provinces, including also a report of the district protected forests in the Kumaun division. The important data relative to alterations in areas, forest surveys, forest protection, silvicultural operations, yields, revenues, etc., are appended in tabular form.

Annual administration report of the forest department of the Madras Presidency for the twelve months ending June 30, 1911, P. M. LUSHINGTON, H. B. BAYANT, and J. S. BARTIE (*Ann. Admin. Rpt. Forest Dept. Madras, 1911, pp. 66+CX+16*).—This is the usual report relative to the constitution, management, exploitation, and administration of the state forests in the Northern, Central, and Southern Circles of the Madras Presidency, including financial statements for the year. The important data relative to areas, working operations, yields, revenues, etc., are appended in tabular form.

The important timber trees of the United States, S. B. ELLIOTT (*Boston and New York, 1912, pp. 332; pls. 32*).—This work, which is based in part on the author's personal observations and in part on the literature of the subject, is offered as a manual of practical forestry for the use of foresters, students and laymen in forestry, lumbermen, farmers and other landowners, and all who contemplate growing trees for economic purposes.

Silviculture, C. WERCKLE (*Bol. Fomento [Costa Rica], 1 (1911), No. 12, pp. 948-953, figs. 2*).—Descriptive notes are given of the important timber and rubber trees of Costa Rica.

Forest catalogue of Mexico (*Catalogo Forestal de la Republica Mexicana. Mexico: Govt., 1912, pp. 29*).—This comprises a catalogue of the more important trees and shrubs forming the woods in the tropical, temperate, and cold regions of Mexico. The data given include the habitat, common and scientific names, and industrial uses. Partial information is also given on a large number of unidentified trees.

The hardy catalpa (*Catalpa speciosa*) (*Kansas Sta. Circ. 20, pp. 19, pls. 8, fig. 1*).—A popular treatise on catalpa culture, discussing methods of identifying the hardy catalpa (*C. speciosa*), methods of propagation, planting stock, selection of site, planting operations, cultivation and care, protection against rabbits, cutting back, form and size, fungus disease, length of rotation for the catalpa, second crop, cutting, seasoning, durability and character of catalpa wood, range of successful growth, and catalpa growing as a commercial enterprise.

On the histology of woods of *Biota orientalis* and *Thuja occidentalis*, F. HOLLENDONNER (*Bot. Közlem. [Budapest], 11 (1912), No. 2, pp. 45-57, figs. 7*).—A detailed study of the wood structure in the above named species.

A note on some germination tests with sal (*Shorea robusta*) seed, R. S. THOUR ([*Indian Forest Bul. 8, 1912, pp. 13*]).—The tests here reported in detail were made to ascertain to what extent the fertility of sal seed is affected by

the size and condition of the trees producing it and by the locality and the type and density of the forest in which the trees grow.

Of the factors observed the time of collection was the only one which appeared to have an influence on the fertility of the seed. The most fertile seed were obtained at the middle of the seeding period.

Influence of the origin and germinative power of pine seed upon the progeny, G. SCHRÖDER (*Deut. Landw. Presse*, 39 (1912), Nos. 36, pp. 421-423, fig. 1; 37, pp. 437, 438).—A popular summary of European investigations.

Monograph on the rubber industry in Bolivia, M. V. BALLIVIAN and C. F. PINILLA (*Monografía de la Industria de la Goma Elástica en Bolivia. Bolivia: Govt., 1912, pp. V+354+LXXXIV+III, pls. 9*).—This monograph contains general considerations relative to the geography, climatology, and resources of Bolivia and discusses in detail the rubber industry of the country relative to its history, botany, methods of exploitation, and marketing. A statistical account is given of the industry in the various producing regions of Bolivia and the laws relating to the industry are appended.

Growing a woodlot from seed, J. A. FERGUSON (*Missouri Sta. Circ.* 52, pp. 139-146, figs. 2).—Popular instructions are given for starting a forest nursery and the establishment of a woodlot on the farm, including tabular data regarding the collecting, storing, and planting of tree seeds.

Results of sand and ravine binding work in Russia (*Ezheg. Lies. Dept., 1* (1909), pp. 423-494).—An account is given of sand and ravine binding work conducted in the Voronezh, Kharkov, Poltava, Saratov, and Samara provinces of Russia. Little attention has been paid to the restoration of ravines thus far. The fixation of sand dunes has been done largely with sand willows and pines.

Note on the antiseptic treatment of timber in India, with special reference to railway sleepers, R. S. PEARSON (*Indian Forest Rec.*, 3 (1912), No. 2, pp. 107, pls. 9, fig. 1).—This note briefly reviews past experiments made in India with special reference to the preservation of railway ties, reports the results of the experiments made at the Imperial Forest Research Institute during the past 2 years with a variety of antiseptic solutions, and gives a résumé of the work which it is proposed to carry out in the future.

On wood preservation with fluorids, R. NOWOTNY (*Österr. Chem. Ztg.*, 15 (1912), No. 8, pp. 100-102).—The author describes some experiments recently started in Austria in the use of bellit, a new fluorid combination, for the preservation of wooden poles, and gives a progress report on the comparative tests of zinc fluorid, copper sulphate, and creosote for preserving poles (*E. S. R.*, 20, p. 544). The tests were started in 1905 and 1906.

An inspection of the poles in 1911 indicated that creosote was by far the most efficient preservative and that zinc fluorid was much more efficient than copper sulphate. The cost of creosoted poles, however, was considerably higher than those treated with zinc fluorid.

The experiments are to be continued.

How to prolong the life of fence posts, J. A. FERGUSON (*Missouri Sta. Circ.* 51, pp. 135-138, fig. 1).—A popular circular discussing various methods of prolonging the life of fence posts, in which special consideration is given to the use of creosote by the open tank method (*E. S. R.*, 19, p. 150). A simple form of open tank is described.

## DISEASES OF PLANTS.

Diseases and injuries to cultivated plants in 1909 (*Ber. Landw. Reichsanste Innern*, 1911, No. 25, pp. VIII+270).—A summary is given of literature relating to plant diseases and insect pests and their control.

**Fungi, an attempt at their classification**, P. VUILLEMIN (*Les Champignons, Essai de Classification*. Paris, 1912, pp. VII+425).—This is one of a series of 12 volumes treating of fungi. It contains a historical review of different systems of classification, after which the author treats of the grouping of fungi according to their cytological and biological characters.

**Some new parasitic fungi of Japan**, M. SHIRAI and K. HARA (*Bot. Mag. [Tokyo]*, 25 (1911), No. 290, pp. 69-73, pl. 1; abs. in *Bul. Trimest. Soc. Mycol. France*, 27 (1911), No. 3, p. 397).—The authors report, with illustrations and descriptions, the following new species of Japanese fungi: *Lophodermium chamæcyparisi*, *Asterula chamæcyparisi*, *Phæospharella japonica*, *Leptosphaeria cinnamomi*, *Mycospharella paulownæ*, *M. zingiberi*, *M. macleayæ*, and *Sphaerulina aucubæ*.

**Notes on the Japanese species of Phragmidium**, M. KASAI (*Trans. Sapporo Nat. Hist. Soc.*, 3 (1909-10), pp. 27-51, pl. 1).—The author describes 17 species of *Phragmidium* occurring in Japan, 11 of which are peculiar to that country and 3 are new to science. The species occur parasitically on *Potentilla*, *Rubus*, *Rosa*, and *Sanguisorba*.

**Cardinal temperatures for the germination of uredospores of cereal rusts**, E. C. JOHNSON (Abs. in *Phytopathology*, 2 (1912), No. 1, pp. 47, 48).—The author has made a study of the effect of temperature on the germination of the spores of cereal rusts, believing that it would throw further light on the relation of meteorological conditions to rust development. The investigations were carried on with the uredospores of *Puccinia graminis* on wheat, barley, and oats, *P. rubigo-vera* on wheat and rye, and *P. coronata* on oats. The spores were obtained from fresh material, and the germinations were made in distilled water in incubators in which the temperature ranged from 1.5 to 31° C.

In the experiments the maximum and minimum temperatures for the different rusts were as follows: *P. graminis*, from 2 to 31°; *P. rubigo-vera* on wheat and rye, about the same; *P. coronata* on oats, a higher minimum, 7 to 8°, with a maximum of 30°.

The optimum temperature could not be definitely determined by percentages, on account of the lack of uniformity between 9 and 25°. From the development of the germination tube, the optimum temperature appeared to be between 12° and 17° for all the forms studied.

These low cardinal temperatures are believed to explain such points as the difficulty with which infection takes place in excessively warm greenhouses and on hot days; the difficulty of finding viable uredospores in early spring, the majority already having germinated; and the favoring of rust development and epidemics by subnormal temperatures at the critical infection periods of the host plants.

**A new method of combating smut of cereals**, G. D'IPPOLITO (*Bol. Quind. Soc. Agr. Ital.*, 16 (1911), No. 19, pp. 680-685; abs. in *Riv. Patol. Veg.*, 5 (1911), No. 9, pp. 133).—The main features of this method are (1) steeping the grain in water at from 20 to 22° C. for 4 hours to start the growth of the internal mycelium and (2) placing it in water at 52° for 10 minutes to kill the growing fungus.

**Ergot on oats**, C. W. WARBURTON (*Bot. Gaz.*, 51 (1911), No. 4, p. 64, fig. 1; abs. in *Centbl. Bakt. [etc.]*, 2. Abt., 32 (1912), No. 6-12, pp. 300, 301).—The author reports the discovery at Ames, Iowa, of ergot (*Claviceps purpurea*) on oats, a disease said to be new in the United States. The attack was noted on a variety immune to smut in July, 1909, a wet season favorable to ergot epidemics. It did not reappear in the dry season of 1910.

**Leaf spot of oats**, H. NILSSON-EHLE (*Sveriges Utsädesför. Tidskr.*, 21 (1911), No. 1, pp. 54-56, pl. 1; abs. in *Bot. Centbl.*, 116 (1911), No. 23, p. 603,

604).—The author, in resumption of previous work on *Scolecotrichum* (E. S. R., 23, p. 46), mentions the fact that this disease, known in Sweden for about 20 years and associated with too strong a liming of the soil, is best controlled by the application of ammonium sulphate, a remedy already in successful use by cultivators in more southern lands.

**A Sclerotium disease of blue joint and other grasses, A. B. SROUT (Wisconsin Sta. Research Bul. 18, pp. 207-261, pls. 8).**—A study is reported of a disease of blue joint and other grasses, which was begun by the author in the summer of 1907.

The disease is due to the fungus *S. rhizodes*, which attacks the leaves of various grasses, causing them to become dried, rigid, and bent into characteristic shapes. Upon the leaves felts of mycelium are produced from which sclerotia are developed. The development of the fungus on the leaves is most vigorous during April and May, when the death of the entire culm may result.

The fungus has been found on 11 species of grasses about Madison, Wis., being especially destructive to *Calamagrostis canadensis*, which serves as its principal host. It is vigorously parasitic on the leaves, less so in the buds and stems, and but slightly so on the roots, where it assumes some of the characteristics usually associated with mycorrhiza.

The fungus is said to be of considerable economic importance, having destroyed or dwarfed as much as 45 per cent of the plants of *C. canadensis* in a meadow near Madison, Wis., in the season of 1911. It seems to be quite generally distributed throughout Wisconsin, but has not been reported elsewhere in America.

Further data are desired on additional host plants, geographic range of the fungus, economic importance, germination of the sclerotia, and infection of the seedlings.

A bibliography of the subject is included.

**Potato crop and seed, O. APPEL (Illus. Landw. Ztg., 31 (1911), No. 15, pp. 134-136; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11-15, pp. 396, 397).**—In continuance of previous work (E. S. R., 21, p. 243; 22, p. 347; 23, p. 148) the author discusses the various potato diseases of Germany in connection with the problem of their prevention as related to seed tubers and their treatment. The recommendations made include (1) sufficient drying on harvesting to check multiplication of bacteria and permit formation of wound cork, and (2) the selection of good sized tubers from healthy and well bearing plants.

**Blackleg of potato, W. BEHRENS and G. MARPMANN (Ztschr. Angew. Mikros., 16 (1911), No. 4, pp. 94-99; abs. in Centbl. Bakt. [etc.], 2. Abt., 32 (1912), No. 6-12, pp. 326, 327; Bot. Centbl., 119 (1912), No. 8, p. 192).**—The authors report that an examination of plants injured by insects and affected by this disease showed no bacteria directly, but it is claimed that culture methods gave 7 characteristic species of which 2 appeared able to produce the disease. These are described. It is suggested that inoculation on a larger scale, and under more nearly natural conditions than those employed, might lead to more positive results.

**Inheritance of leaf-roll disease, A. SCHMID (Illus. Landw. Ztg., 31 (1911), No. 17, p. 160; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11-15, pp. 331, 332).**—The recent invasion of parts of Switzerland by this disease and resulting decrease of crops led to an experimental study of the possible hereditary effects of its attacks. Nineteen sound and 19 diseased tubers of like sort and size from the same field were planted and the resulting vegetation and crops compared. It was found that the plants from the diseased tubers were backward and showed the characteristic leaf-roll form, while the crop was

only about 21 per cent of that from the sound tubers. The weather was abnormally damp during the experiment.

The factors governing germination and infection with *Phytophthora infestans*, I. E. MELHUS (Abs. in *Phytopathology*, 2 (1912), No. 1, p. 46).—In experiments involving about 300 tests at temperatures ranging from 8 to 14° C., 96 per cent of the spores germinated, while at 21 to 25° only 20 per cent germinated, indicating that comparatively low temperatures favor germination with *P. infestans* as well as with *Cystopus* (E. S. R., 26, p. 342). The optimum temperature for oospore germination was found to lie between 10 and 13°, the minimum between 1 and 2°, and the maximum between 21 and 24°. Field observations showed oospore germination to occur freely on potato plants at temperatures between 8 and 15°.

Inoculation experiments showed that temperatures of 10 to 13° produced higher percentages of infection than 21 to 25°, and that the upper surface of the potato leaf is less easily infected than the lower.

The effect of Bordeaux mixture and various polysulphids on the germination of *P. infestans* and *Plasmopara viticola* was investigated. Varying the amount of lime in Bordeaux mixture did not affect the toxicity. None of the constituents of the polysulphids was found toxic at the proportion occurring in the polysulphid. The most nearly toxic agent, however, was the alkaline constituent.

Hypertrophy-structure in potatoes, M. FÜCSKÓ (*Bot. Közlem.* [Budapest], 11 (1912), No. 1, pp. 14-29 (3)-(11), figs. 10).—This is a study of the structure of the abnormal developments resulting from an oversupply of water in contact with tubers. These are figured and described. One result is the formation of abundant starch in the subcuticular cells. This, however, seems to be transitory. A regular periodicity is said to be apparent in the formation of these excrescences.

Relative merits of lime sulphur, lead benzoate, and Bordeaux mixture for spraying potatoes, F. C. STEWART and G. T. FRENCH (Abs. in *Phytopathology*, 2 (1912), No. 1, pp. 45, 46).—In 1911 the authors made a comparative test of lime-sulphur, lead benzoate, and Bordeaux mixture for spraying potatoes, the mixtures being thoroughly applied 6 times at intervals of 2 weeks. Tip burn was the only important disease involved. Bordeaux mixture checked this, prolonged the life of the plants, and increased the yield at the rate of 100.3 bu. per acre; lead benzoate was found to neither benefit nor injure the plants; while those sprayed with lime-sulphur were smaller than the checks, as much affected by tip burn, and yielded 39.5 bu. less per acre than the checks.

The conclusion reached is that neither lime-sulphur nor lead benzoate can be profitably substituted for Bordeaux mixture in spraying potatoes. Both lack the stimulating influence possessed by Bordeaux mixture, while lime-sulphur tends to dwarf the plants and lower the yield.

Nematode disease of the sugar beet, B. NÉMEC (*Ztschr. Pflanzenkrankh.*, 21 (1911), No. 1-2, pp. 1-10, figs. 6; abs. in *Centbl. Bakt.* [etc.], 2. Abt., 32 (1912), No. 6-12, pp. 311, 312; *Bot. Centbl.*, 116 (1911), No. 24, pp. 623, 624).—This is a study of the anatomical changes observed in roots of the sugar beet as the result of attacks by eelworms.

Most noticeable are the so-called giant cells which develop by growth and fusion of cells in the vascular bundles, sometimes closing the channels completely. Such giant cells have thick walls and abundant cytoplasm, sometimes with several large nuclei. They are said to hinder or interrupt transportation of water and other materials along the roots attacked, and by checking root-tip growth they lead to the development of new lateral roots and the impoverish-

ment and exhaustion of the plant. This becomes yellowed, and easily wilts and dies in case of unusual heat or dryness. The losses observed in crop returns are said to be due to the impoverishment of the plant, (1) by stoppage of channels and (2) by withdrawal of material (a) for the building of the giant cells and of the lateral roots and (b) for the nourishment of the parasites. The parasites are thought to produce on entering the root a stimulation which occasions the observed abnormal cell development. The giant cells are thought to function somewhat as glands or nectaries, producing material suitable for nourishment of the nematodes.

**Averting nematode injury**, KRÜGER (*Bl. Zuckerrübenbau*, 18 (1911), Nos. 17, pp. 294-300; 18, pp. 311-313; *abs. in Ztschr. Landw. Versuchsw. Österr.*, 14 (1911), No. 12, p. 1479).—This is a preliminary report on the author's study of nematodes on sugar beets continued for 4 years and not yet completed, but from which the following conclusion may, in his opinion, be justly drawn:

Nematode attack is favored by poverty of soil, by injurious constituents therein, and by attacks of other parasites. Two plans for the protection of the crop are indicated. The first, which aims to limit increase and perpetuation of the infection, consists in removing all such weeds and offal from the beets as might help to shelter and nourish the parasites. The second plan, which aims at destruction of the parasites, consists in the employment of lime, carbon bisulphid, etc., and of the Kühn method of trap-plants. It is believed that by these means the injury may be greatly reduced, if not entirely prevented.

**A new method for combating the sereh disease of sugar cane**, T. VALETON, Jr. (*Teyssmannia*, 22 (1911), No. 12, pp. 767-772).—Attention is called to the occasional resistance of certain varieties of cane to this disease, and the probable value of breeding experiments to fix and extend these forms is discussed.

**A new fruit disease of eggplant**, J. HANZAWA (*Trans. Sapporo Nat. Hist. Soc.*, 3 (1909-10), pp. 83-87, pl. 1).—A description is given of *Rhabdospora melongenæ* n. sp., a fungus that sometimes causes a severe rotting of the fruit of the eggplant.

**Withertip of fruit and ornamental trees**, E. VOGES (*Dout. Landw. Presse*, 39 (1912), No. 24, pp. 285, 286, figs. 4).—An account is given of a disease of twig ends of cherry, poplar, and other trees, resulting in their speedy death, while neighboring twigs continue to appear healthy. Investigation revealed the presence of certain fungi in the affected parts. Of these, 3, described and illustrated, are said to be *Nectria ditissima*, *Fusarium wilkomi*, and *Monilia cinerea*.

**Cement dust injury to fruit trees**, P. J. ANDERSON (*Abstr. in Phytopathology*, 2 (1912), No. 1, p. 45).—An investigation has been begun at the request of certain fruit growers to determine the effect of dust from cement mills.

The dust was found to contain a high percentage of soluble calcium salt. This dissolved in the stigmatic secretions and rendered them alkaline, and pollen would not germinate in the alkaline solution. Artificial tests of the pollen of cherries, pears, and apples gave no germination, even in very weak solutions of the dust. Further tests showed that there was no germination even when the calcium was not in an alkaline condition.

**Foliage diseases of the apple**, H. S. REED, J. S. COOLEY, and J. T. ROGERS (*Virginia Sta. Bul.* 195, pp. 23, figs. 13).—This bulletin is based on experiments made during the years 1910 and 1911, the diseases investigated being the frog-eye leaf spot, cedar rust, and apple scab as a foliage disease.

The frog-eye leaf spot is said to be widely distributed and is probably due to a number of fungi which produce similar appearances on the leaves. The varie-

ties Ben Davis and Black Twig seem more subject to this trouble than others, York Imperial suffering less severely and Winesap being hardly affected at all.

During the seasons of 1910 and 1911 spraying experiments for the control of these leaf diseases were carried on in a number of places in Virginia to test the value of different fungicides, the times of application, etc. The experiments showed that dilute lime-sulphur solution is as effective in controlling the leaf spot and scab as standard Bordeaux mixture. Where the scab is not abundant the first spraying should be made immediately after the falling of the flowers, followed by a second and third application at intervals of from 15 to 20 days. Where scab is abundant an additional application of the spraying material should be made just before the blossoms open. Bordeaux mixture appeared to be the only fungicide which was successfully used for combating bitter rot. For this purpose 3 applications should be given the trees, the first between June 20 and July 1, with subsequent sprayings at intervals of from 15 to 20 days. The addition of iron sulphate to lime-sulphur or Bordeaux mixture was found to increase the sticking properties of the fungicides without affecting their value in any sense. It was also found that arsenate of lead aside from being a good insecticide had some value as a fungicide.

The injury to the foliage attributed to spraying mixtures is sometimes caused by the use of too great quantity or improperly made mixtures. It was found that fruit may be burned with lime-sulphur if sprayed in very hot weather. Tender skinned apples were affected by Bordeaux mixture in a similar way if sprayed early in the season. The danger of russeting is very slight 2 months after blooming and later. Where early applications of the fungicides are necessary the authors recommend the use of lime-sulphur for the first 2 sprayings.

**Experiments on the simultaneous treatment for the control of downy and powdery mildew.** G. MARTELLI (*Separate from Agr. Etneo, 1911, No. 4, pp. 7*).—The results of experiments for the combined treatment of grapes to control the downy and powdery mildew are given. The vines were sprayed with Bordeaux mixture to which was added an alkaline polysulphid, Bordeaux mixture followed by applications of sulphur, and a proprietary mixture of copper and sulphur. Three applications were given to different lots of over 6,000 grapevines in the experiment, and the cheapest and most efficient fungicide was the Bordeaux mixture combined with the alkaline polysulphid.

**Invasion of Europe by the American gooseberry mildew and oak mildew.** G. KÖCK (*Ztschr. Pflanzenkrankh., 20 (1910), No. 8, pp. 452-455; abs. in Centbl. Bakt. [etc.], 2. Abt., 31 (1911), No. 11-15, p. 345*).—This continues communications by the author on this subject (*E. S. R., 22, p. 743; 23, p. 50; 24, p. 747*), giving here dates and places of first appearance or early appearances of each of these mildews in this region.

**The influence of *Hemileia vastatrix* on the culture of coffee in Java.** P. S. J. CRAMER (*Rev. Agr. Nouvelle-Calédonie, 1911, Nos. 12, pp. 24-50; 13, pp. 16-24*).—An account is given of *H. vastatrix* in Java, the influence it has had on the Arabian coffee production, and means that have been undertaken for its control.

The production of coffee under government control in Java has fallen from an average of 923,333 piculs (123,111,100 lbs.) in the 5 years from 1880 to 1885 to 81,746 piculs in the 2 years from 1906 to 1908, due, it is claimed, to the disastrous invasion of the fungus. To combat the disease, spraying and the growing of resistant varieties have been resorted to. *Coffea liberica*, *C. robusta*, and other species, and some of their hybrids appear quite resistant, and their introduction has been successfully accomplished. Spraying with Bordeaux mixture



has been followed with good results in seed beds and nurseries, but its use in the plantation is thought to be impracticable.

The author comments on the absence of this fungus in American coffee raising countries, and attributes it to a number of factors, among them a lack of suitable climatic conditions, natural enemies of *Hemileia* in America, and the absence of suitable host species on which the alternate generations of the fungus may develop.

Injury to pines by smelter gases, K. FEIST (*Arch. Pharm.*, 249 (1911), No. 1, pp. 7-9; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 32 (1912), No. 6-12, p. 331; *Bot. Centbl.*, 116 (1911), No. 21, p. 553).—This is an account of the author's investigation of the changes produced in the foliage of pines injured by exposure to gases evolved in the smelting of siderite. Comparative examination of the needles of sick and of sound pines showed that the percentage of ash was considerably increased in case of the former. There was also a notable increase of sulphuric acid, which could come only from the air, while the alkalinity of the ash itself was considerably lowered.

New fungi on Japanese bamboos, J. MIYAKE and K. HARA (*Bot. Mag. [Tokyo]*, 24 (1910), No. 286, pp. 331-341; *abs. in Centbl. Bakt. [etc.]*, 2. Abt., 31 (1911), No. 11-15, pp. 321, 322).—The authors give the results of their studies on a number of fungi of which the following appear to be new: *Lastosphaeria culmorum*, *Gaiignardia bambusa*, *Mycospharella bambusifolia*, and *Phaeosphaeria bambusa*. The article is mainly in the Japanese language.

The importance of sanitation in the control of certain plant diseases, L. R. JONES (*Abs. in Phytopathology*, 2 (1912), No. 1, p. 46).—The author states that while fungicidal sprays must continue to be the chief reliance in combating many plant diseases, more attention should be given to the fundamental sanitary measures to secure the healthy development of the host plants. Recent experiments in Wisconsin have shown this to be essentially true with certain diseases of crops introduced into new regions for trucking and canning. These include the cabbage diseases, especially club root, blackleg, and yellows, some pea diseases, the bacterial wilt of cucurbits, and crown gall of nursery plants.

The covering power of the precipitation membranes of Bordeaux mixture, B. F. LUTMAN (*Phytopathology*, 2 (1912), No. 1, pp. 32-41, figs. 6).—A study on the physical properties of the precipitate of Bordeaux mixture is reported, in which an attempt was made to measure as nearly as possible the actual area of the precipitation membrane produced by copper sulphate solution and lime water, or milk of lime. Six formulas were used, including that known as Pickering's Bordeaux mixture.

About 100 cc. of the Bordeaux mixtures was made up, 1 cc. diluted with from 200 to 400 cc. of water, and  $\frac{1}{2}$  cc. of this dilution placed on a cover glass and allowed to dry, after which the membranes were examined microscopically, drawn, and their relative area measured. It was found that increasing the amount of copper sulphate and lime increases the area of precipitation film produced.

The amount of precipitation membrane, as shown by precipitation in hydrometer jars, was determined. The Pickering's Bordeaux showed an apparently large amount of precipitate. This was only apparent, however, as shown by the actual measurements which were given.

In conclusion the author calls attention to the fact that bulk for bulk the same quantity of Pickering's Bordeaux mixture does not have the same covering power as even the 2 $\frac{1}{2}$ :2 $\frac{1}{2}$ :50 mixture. On the other hand, for the amount of material used it produces the greatest amount of film area.

## ENTOMOLOGY.

Report of the entomologist, D. T. FULLAWAY (*Hawaii Sta. Rpt. 1911, pp. 17-24, figs. 4*).—This report consists principally of notes on insects attacking leguminous crops, including the pigeon pea (*Cajanus indicus*), cowpea (*Vigna catjang*), jack bean (*Canavalia ensiformis*), velvet beans (*Mucuna pruriens*), soy bean (*Glycine hispida*), peanut (*Arachis hypogaea*), sweet clover (*Medicago officinalis*), and alfalfa (*Medicago sativa*), especial attention having been given to the enemies of the pigeon pea.

The army worm (*Heliothrips unipuncta*) sometimes devastates large fields of alfalfa before it can be brought under control by its natural enemies, and extensive plantings of jack beans have been made waste by *Spodoptera mauritia*, another common army worm. The foliage of legumes is often badly eaten by certain leaf-rollers, *Omiodes monogona*, *Amorbia emigratella*, and *Archips postvittana*, and by the looper, *Plusia chalcites*, but the damage they inflict is apparently not great except in the case of *O. monogona*, which, so far as is known, feeds exclusively on legumes. It, however, is subject in turn to the attacks of parasites which keep it fairly well in check. *Limnerium blackburni* and *Chalcis obscurata* have been bred from *O. monogona*. The plant louse which attacks legumes is thought to be *Aphis gossypii*. "The larvæ of the syrphid fly, *Xanthogramma grandicornis*, and of the agromyzid, *Leucopis nigricornis*, also prey on aphids and are usually found where aphids are abundant. . . . The cottony cushion or fluted scale, *Icerya purchasi*, which, while normally controlled by *Novius cardinalis*, sometimes becomes very abundant and does considerable damage before the ladybirds become numerous enough to clean it out. . . . Mealy bugs, embracing several species, infest legumes, notably *Pseudococcus longispinus*, *P. citri*, *P. virgatus*, and *P. flamentosus*, but do little apparent damage and are usually controlled by their parasites and predators. The first 3 species have been noticed on pigeon pea and the last more especially on clover. The flat scale, *Saissetia olea*, is common on pigeon pea and crotalaria. The leaves of most of the cultivated legumes, and some other plants as well, are mined by the larvæ of *Agromyza diminuta*." It is thought that this miner will never be a serious pest since it is effectively parasitized by the enlophids *Omphale metallieus* and *Pediobius* sp. The bean pod borer, a caterpillar of the common butterfly *Lycana batika*, is thought to be the most injurious insect attacking legumes, and notes on its life history are presented.

"The dry pods and seeds of legumes are attacked in storehouses and somewhat in the field by certain insects which habitually feed on stored products, notably bruchid weevils. . . . *Bruchus chinensis* and *B. prosopis* have been bred from seeds of the pigeon pea, *B. chinensis* from seeds of the cowpea, and *B. prosopis* and *Caryoborus gonagra* from seeds of keawe (*Prosopis juliflora*). The ptinid beetle *Catorama mexicana* has been bred from seed of the velvet bean, and the common coffee bean-weevil (*Aræcerus fasciculatus*) from pigeon pea seed stored and in the field."

The minor pests observed include *Trichothrips nigricans*, which is abundant in the blossoms of the pigeon pea; *Xiphidium varipenne*, which sometimes feeds on legumes, but is largely carnivorous in habit; a red spider (*Tetranychus* sp.), noticed on the foliage; and bostrychids, which bore the broken stems. Observations of the capsid bug *Hyalopeplus pellucidus* failed to show any predatory inclination as previously reported to be the case.

Brief notes are also given on the occurrence and habits of the Mediterranean fruit fly.

A preliminary study of Kentucky localities in which pellagra is prevalent, H. GARMAN (*Kentucky Sta. Bul. 169, pp. 3-79, pls. 27, figs. 24*).—Within the past 2 years pellagra has attracted attention in some of the mountain counties of Kentucky from which a number of people have been sent to the state asylum at Lexington. At the request of a conference of medical men of the State the author visited the region where pellagra is prevalent with a view to determining whether any fly occurs there that might convey the disease. Several days were spent at Corbin in the latter part of August and in September, and at Pineville in October, in studying the localities in which pellagrous cases are located and giving special attention to the streams in the region as breeding places of the flies. The results of the investigation are here presented and discussed at length under the following headings: The streams, the insects, etc., found in the streams, including Simuliidae, Chironomidae, Culicidae, Tipulidae, Tabanidae, Hemiptera, Coleoptera, Trichoptera, Neuroptera, Ephemera, Odonata, Plectoptera, Arachnida, Protozoa, Crustacea, Bryozoa or Polyzoa, Vermes, Mollusca, fishes and amphibians, also vegetation in and about the streams, and bacteria.

The work concludes with a discussion of the corn crops along the streams, the effect of moldy corn on stock, and the presentation of Dr. Sambon's theory of the transmission of pellagra by simuliids.

The sand flies discussed are *Simulium venustum*, *S. pecuarum*, *S. pictipes*, *S. meridionale*, and *S. reptans*. The author states that he has not at any time committed himself to the insect theory of the spread of pellagra, is not satisfied with the evidence, and in this bulletin has simply presented facts which may bear upon the problem.

The pear thrips, P. J. PARSONS (*New York State Sta. Bul. 343, pp. 3-33, pls. 5, figs. 5*).—This is a report of investigations of *Euthrips pyri*, which, as reported in the account previously noted (*E. S. R.*, 25, p. 658), has become the source of considerable injury to fruit at points in the Hudson River Valley, as well as in California (*E. S. R.*, 24, p. 455).

The author concludes from investigations conducted that the pest has been a source of injury in the Hudson River Valley for a period of some 5 years. "The most severe attack of the thrips occurred during 1910, when the pear crop in many orchards was much reduced. Besides losses in yields the trees were seriously checked by injuries to leaf buds and leaf clusters; and in some orchards the season was much advanced before the trees presented normal conditions of growth. The productiveness of pear orchards during 1911 was greater than the preceding year, but blighting of blossom clusters was general and orchards suffered losses in yields according to the severity of the attacks by the thrips."

"The adult insect attacks the developing buds, which checks the natural growth, and blossom clusters most seriously affected eventually fall. The deposition of eggs in the fruit stems weakens the stems, causing the young fruit to drop. The quality of prunes that mature may also be impaired by the feeding of the larvae on the skin of the fruit causing a diseased condition known as 'scab.' The Napoleon Bigarreau and Black Tartarian cherries and Imperial prune are among the varieties known to New York fruit growers that are attacked by the thrips. Almonds, apricots, and peaches, while also subject to injuries, do not usually sustain such serious losses unless the thrips are very numerous." During 1911 it was observed in New York chiefly on apples, apricots, cherries, peaches, pears, plums, and quinces. "Apples were generally infested with thrips, but the destruction of blossom clusters was not so common as with the pears. In spite of the presence of large numbers of the thrips in the buds there was usually a large setting of apples. While all of the leading commercial varieties

were more or less infested by the thrips, the most conspicuous injuries to blossom and leaf clusters during the past season were observed with such varieties as Astrachan, Gravenstein, McIntosh, Ben Davis, and Oldenburg."

The life history of the pest is described, together with technical descriptions of its stages. "The date when the mature insects first appeared on the trees this spring was not obtained, but a few specimens were observed on April 26. They seemed to be most numerous and destructive from April 28 through the first week in May. With the falling of the petals from May 11 to May 14 the adults became less numerous on pear trees, and practically disappeared from plantings of this fruit by the latter part of the month. Oviposition was most active during the last few days of April and up to the middle of May. The first young thrips was detected on May 9, and on succeeding days larvæ emerged in large numbers, being very conspicuous in the calyx basins of the fruit following blossoming. The latest date of emergence of larvæ was May 25. The young thrips commenced to drop to the ground beneath the trees on May 17, when several of them were caught on sheets of sticky fly paper."

The actual range of distribution in New York has not been ascertained. While its destructiveness to pear orchards has attracted the attention generally of pear growers about North Germantown, Germantown, and Cheviot, scattering numbers of the insect have been observed on pears grown south of this region, about Troy, to the north about Stuyvesant, and eastward to a line running between Chatham, Glencoe Mills, and Clermont. On April 26 specimens of thrips were found at Geneva in apple buds, which plainly showed evidences of injury.

The author's experiments show that "the period for effective spraying is during the time when the buds are breaking and until they are entirely opened at the tips. The most promising spraying mixtures are the nicotine preparations in combination with kerosene emulsion or soap. Two or 3 applications on successive days during the past year largely prevented important injuries to pear trees. The physical features of the locations of the orchards, such as the direction and elevation of the slopes of the land, proximity to the Hudson River and character of the soil, have a marked influence on the development of the buds and the time of blossoming. The time for effective spraying will therefore vary with individual orchards."

A new fruit tree enemy in New York, F. H. HALL (*New York State Sta. Bul.* 343, popular ed., pp. 8, fig. 1).—A popular edition of the above.

The grape leaf-hopper and its control, F. Z. HARTZELL (*New York State Sta. Bul.* 344, pp. 29-48, pls. 4, figs. 3).—This paper treats of *Typhlocyba comes*, its life history and habits, food plants, and injury, with a brief report of experimental control work, conducted in continuation of that previously noted (E. S. R., 24, p. 751).

This important enemy of the grape is said to have been on the increase in Chautauque County during the past few years. It "weakens the vines by piercing the epidermis of the underside of the leaf and sucking the cell sap, thus injuring the cells and exposing them to the drying action of the air. This injury results in a decrease in the amount of wood, and it also affects the quantity and quality of the fruit. Fruit from badly infested vines is poorly ripened."

"Experiments have proven that a spray containing 0.02 per cent nicotine is the most effective and safest contact insecticide for the control of the grape leaf-hopper. This must be directed against the nymphs, which are hit by applying the spray to the undersides of the leaves.

"The application of the spray for this insect can be done by the usual hand spraying with trailing hose or by an automatic leaf-hopper sprayer which is described in this bulletin. This latter device was developed during the past

season and it has done efficient work. With high pressure and proper adjustment of the nozzles the insect can be efficiently controlled."

Fighting leaf-hoppers in the vineyard, F. H. HALL (*New York State Sta. Bul. 344, popular ed., pp. 8, figs. 3*).—A popular edition of the above.

Burn the chinch bug in winter quarters, T. J. HEADLEE (*Kansas Sta. Circ. 19, pp. 8, figs. 7*).—This circular calls attention to the fact that it is imperative necessary for the farmer to determine in the fall whether his grasses are harboring a dangerous number of chinch bugs, and to the importance of burning infested grasses late in the fall or early winter, as most of the bugs not killed by the fire perish from exposure.

Records made of the average winter mortality in different types of cover are as follows: Bunch grass 65 per cent; big bluestem 65 per cent; dry pieces of manure 98 per cent; Osage oranges 99 per cent; rubbish, leaves, etc. 99 per cent; turnips 99 per cent; corn husks and stalks 100 per cent; and Osage orange tree bark 100 per cent.

The great value of winter burning was demonstrated in the fall of 1910 in an area of 25 square miles in northern Sumner County. "During the months of November and December, 1910, a rectangular block,  $3\frac{1}{2}$  miles wide by 5 miles long, was stripped of its chinch-bug cover by fire and the remaining  $7\frac{1}{2}$  square miles were more or less completely burned. Although the burning was not as close as was desired, the average length of the stubble being 1.5 in., whereas it should have been less than 1 in., an average of 738 bugs out of every thousand present when the firing began were destroyed, and this mortality was raised to 984 per thousand by the first of the following March."

"From the time the bugs appeared in the wheat in the spring, as an average, they were from 6 to 20 times more numerous in the unburned district than in the burned sections. . . . The yield of the burned area averaged about 2.1 bu. more per acre than that of the unburned, showing that a saving of about \$7,000 was effected in wheat alone. Oats, being only slightly infested, showed little difference in yield. In the burned area the reduction of bugs was so great that no corn was killed at harvest time, while in the unburned area from 1 to 40 rows standing adjacent to wheat were sucked dry and completely ruined."

A map is given of the burned area and surrounding territory.

The San José scale in Missouri, L. HASEMAN (*Missouri Sta. Bul. 98, pp. 61-116, figs. 16*).—This is a general account of the San José scale, its history and introduction into Missouri, provisions for its control in Missouri, present distribution in the State, life history and appearance, development, reproduction, period of larval activity, methods of spread, food plants, injury, natural enemies, and remedial measures, with a brief report of control experiments.

The scale was first introduced into Missouri between 1892 and 1894. At the present time infestations have been located in one-third of the counties of the State, though the bulk of the scale is confined to some 6 counties. "The nurseries of the State so far as examined had remained apparently free of the scale until 1906, but since then slight infestations have been found in 3 or 4 small local nurseries and in 3 of the larger ones, but in each case it has been stamped out. . . .

"The lime-sulphur wash is by far the cheapest on the market, and when properly prepared and applied is just as effective for the control of the scale as any of the other washes, besides being an excellent remedy for plant lice and having fungicidal properties. . . . Of the 4 miscible oils tested it is impossible to detect any difference in their effect upon the scale. A fall and spring application of either of them at a strength of 1:15 is thoroughly effective. They should not be used at a greater strength except when only one application can be given, when 1 gal. of oil to 10 or 12 gal. of water will prove effective.

They should never be used at a greater dilution than 1:15. Summer spraying for the control of the scale with any of the washes so far tested is impracticable.

**Papara on insects affecting vegetables.**—The imported cabbage webworm (*Heliothis virescens*), F. H. CHITTENDEN and H. O. MARSH (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 3, pp. 23-45, figs. 4*).—Since 1897 this webworm has repeatedly come under observation as a pest in additional States and Territories, namely, in Florida, Mississippi, North Carolina, Texas, California, and Hawaii, the reports of which are here presented. Technical descriptions of its stages are given in connection with life history notes.

A total of 206 eggs is recorded as deposited by a single female. At a temperature of from 80 to 84° F. the eggs hatched 3 days after deposition. "Besides cabbage, turnips and beets, collards, cauliflower, kale, rutabaga, radish, kohlrabi, mustard, rape, horse-radish and some other cultivated plants, such as 'Japanese radish,' are subject to attack and injury. Among weeds and wild food plants are the common shepherd's purse (*Bursa* [*Capsella*] *bursa-pastoris*), and 'pussley' or 'cutter's grass,' otherwise purslane (*Portulaca oleracea*). The natural enemies mentioned include 2 tachinids (*Exorista pyste* and *Plagioprospherysa*, sp.), an ichneumonid (*Limnerium tibiator*), and 2 other hymenopterous parasites, namely, *Meteorus vulgaris* and *Temelucha* (*Porizon*) *macer*.

Notes on the occurrence of the pest in Hawaii, together with a report of remedial experiments conducted by the junior author, follow, together with a list of the other enemies of cabbage in Hawaii.

"At Honolulu eggs have been observed to hatch in from 2 to 3 days. . . . The larvae usually reach maturity in from 13 to 15 days. They then leave the plants, burrow slightly beneath the surface of the soil, and form rather frail cocoons of webbed-together grains of earth, within which they pupate within 2 days. . . . The adults usually issued in from 6 to 12 days after pupation. . . . Four generations of this webworm were reared in an insectary at Honolulu." One female lived in a cage for 10 days and deposited 235 eggs, while another lived 14 days and deposited 237 eggs.

It is concluded from the experiments reported that arsenicals can not be depended upon to control this species on cabbage. "In light of our present knowledge, the best methods of controlling this webworm consist of clean culture, the screening of seed beds, and thorough cultivation. The necessity of prompt destruction of crop remnants and the employment of other clean cultural methods can not be too strongly emphasized. . . . By screening the seed beds it is possible to prevent infestation until the time of transplanting. When this method is followed it is advisable to leave a few plants exposed near the screened beds [as traps]. . . . Inasmuch as the larva of this species pupate in frail cocoons near the surface of the soil, it is possible that thorough cultivation would crush some of the pupae and at the same time induce a more vigorous growth of the plants."

A bibliography of 22 titles is appended.

**Papara on insects affecting vegetables.**—A little-known cutworm (*Poragrotis vetusta*), F. H. CHITTENDEN (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 4, pp. 47-51, pl. 1*).—Reports received of the attack of this pest at Southern Pines and Poplar Branch, N. C., and Norfolk, Shelton, and Churchland, Va., in which vegetables, berries, and field crops were injured, are first considered. Brief descriptions are then given of the moth and larva; the eggs and earlier stages of the larva have not been observed. *Apanteles* n. sp., near *agrotidis*, and the tachinid fly *Limnomyia picta* are said to be the only enemies of this insect that are known at the present time.

At Norfolk, Va., the use of arsenate of lead, 4 lbs. to 50 gal. of water, gave good results in combating the pest on parsley.

The fruit tree leaf-roller (*Archips argyrospila*), G. W. HERRICK (*New York Cornell Sta. Bul. 311, pp. 279-292, pls. 4, figs. 3*).—As noted in a previous account (*E. S. R.*, 26, p. 758), this leaf-roller suddenly came into prominence in the spring of 1911 as a serious pest to apples and a minor one to pears in New York orchards.

The species was first described as of economic importance in 1869 when Packard reported it as attacking the cherry tree, but eastern growers have been comparatively free from its ravages. It has been bred by the author from larvæ on the apple, pear, sweet cherry, wild cherry, black walnut, and mountain ash. At Bethany Center the larvæ were found in abundance on plum, pear, quince, apple, and cherry trees.

"The larvæ appear as the buds are bursting, and begin to attack the unfolding leaves. They bend the leaves over and tie them together with silk. Within this sort of nest the larvæ live and eat the leaves. As soon as the blooms appear the larvæ begin to eat off the blossom stems and tie them together with silken threads, along with the leaves surrounding the blossom cluster. This webbing and tying together of the blossom clusters is a most pernicious habit because it interferes seriously with spraying for the codling moth. In one Baldwin orchard in which the larvæ were very abundant, the blossom clusters were so webbed together and covered over with silk, dried petals, and leaves that it was almost impossible to get the spray mixture into the calyx cup. As soon as the young apples or pears begin to set they are tied together with silk, while the larvæ live inside and gnaw cavities into the sides of the young fruit. . . . In New York orchards during the past season a very large number of pears and apples were totally destroyed by the larvæ, and many others were seriously marred and deformed. . . . The larvæ also work on the leaves, rolling them and living within the roll. Here, effectually hidden, they feed on the tender tissues of the leaves."

The pest undoubtedly passes the winter in New York State only in the egg stage, one generation a year apparently being the normal habit. The eggs are laid in June in small oval convex patches on the bark of the smaller twigs, the major number being deposited during the middle days of the month. The eggs remain on the trees until the following May, or a period of more than 10 months. In 1911, eggs hatched as early as May 4 and were found hatching in the field in abundance on May 9.

"When the larva becomes full-grown it spins a very thin, flimsy web in a rolled leaf, or between the leaves that are tied together, and changes to a pupa. . . . In the cages in the insectary the pupal stage lasted 9 to 12 days. . . . Our records during the season of 1911 show that the moths were emerging nearly every day from June 5 to June 21, with the latest moth appearing June 24. . . . It is evident that by the middle of June the moths were emerging in greatest numbers and that they were almost entirely out before July."

Four species of hymenopterous parasites were reared from larvæ and pupæ in cages. Many primary and secondary parasites and at least 1 tertiary parasite were reared in the field. *Pimpla conquisitor* was the parasite reared in greatest numbers, the others being *Amicroplus* sp., *Phytodietus vulgaris*, *Sympiesus* sp., *Pimpla inquisitor*, *Glypta simplicipes*, and *Carcelia nigropalpus*.

Methods of control have been summarized by the author as follows: "We would advise a thorough drenching of the trees with lime-sulphur at scale strengths for a dormant spraying to prevent the eggs from hatching, provided one is going to spray for the San José scale or the blister mite; we are not yet ready to recommend a spraying for the eggs of the leaf-roller alone. This application should be made as late as possible in the spring before the buds burst. We would advise a thorough spraying with arsenate of lead at the rate

of 2½ to 3 lbs. to 50 gal. of water, before the buds burst but while they are swelling or just as the tips begin to show green, and again before the flower buds open. These applications will also catch the bud-moth larvæ, which are serious pests."

The report concludes with brief notes on 2 closely allied species, namely, the oblique-banded leaf-roller (*Archips rosaceana*), and the ugly-nest leaf-roller (*A. cerasivorana*). A partial bibliography consisting of 41 titles is appended.

The alfalfa gall midge (*Asphondylia miki*), F. M. WEBSTER (*U. S. Dept. Agr., Bur. Ent. Circ. 147, pp. 4, figs. 6*).—This circular has been prepared in order to direct the attention, especially of alfalfa growers in the southwestern portion of the country, to the appearance of this foreign insect in the United States. It can not be predicted at the present time what injury this insect will cause in the United States, though it has not so far proved destructive.

Galls, from which this insect was afterward reared, were first found in limited numbers at Sacaton, Ariz., in June, 1900. They were found about Tempe and Phoenix, Ariz., in June, 1911, and at Tularosa, N. Mex., in July of the same year. A translation is given of the original descriptions of the gall as found in alfalfa fields in the vicinity of Vienna, Austria.

While but little definite information has been gained in relation to the pest, it apparently winters in the pods. So far as now known its breeding season during summer is rather short, as it has not been noticed earlier than late May or later than September. The source of its entrance into this country remains obscure, but the author suggests that it may be working its way from Mexico northward. That it is preyed upon extensively by parasitic insects, although the parasites are all new to science and have never been described, is thought to imply a rather long residence in this country. "The indications are that it is spreading over the alfalfa-growing sections of the extreme Southwest, but it does not necessarily follow from this that it will prove so destructive as have many other insects coming to us from across the Atlantic Ocean. . . .

"Mowing the alfalfa just as the plants are coming into bloom will doubtless keep the numbers of the midge much reduced, as this method tends to prevent development, and, therefore, to curtail increase in numbers."

Papers on insects affecting vegetables.—Arsenite of zinc and lead chromate as remedies against the Colorado potato beetle, F. A. JOHNSTON (*U. S. Dept. Agr., Bur. Ent. Bul. 109, pt. 5, pp. 53-56*).—This is a report of a series of experiments conducted in cooperation with the Virginia Truck Experiment Station in which the insecticidal value of arsenite of zinc and of lead chromate was compared with that of other arsenicals.

"The results obtained from the use of lead chromate were very unsatisfactory as compared with those in the case of other insecticides used. The lead chromate employed was in the form of a powder, and great difficulty was experienced in making it mix well with water, it having a tendency to settle quite rapidly, requiring constant agitation to keep it in solution. It adhered well to the foliage, and its color stood out quite prominently in contrast to the other plants. However, the young larvæ seemed to be able to feed on plants that were thoroughly covered with the material without receiving much injury.

"The arsenite of zinc employed was also in the powdered form. It is much lighter than lead chromate and remains in suspension in water much better. It adheres to the foliage very well and does not, so far as could be observed, burn or injure the plants in any way." In experiments with arsenite of zinc at the rate of 1, 1½, and 2 lbs., respectively, to 50 gal. of water, by far the best results were obtained where 2 lbs. of the arsenite was used. "Without doubt



an even greater amount of the arsenical might be used without injury to the plants and with correspondingly greater efficiency in killing the beetles."

Papers on cereal and forage insects.—The so-called "cutworm bug," (*Sphenophorus callosus*), F. M. WEBSTER (*U. S. Dept. Agr., Bur. Ent. Bul. 98, pt. 4, pp. 53-71, pls. 4, figs. 6*).—This is a summarized account of the present knowledge of *S. callosus* and includes information received from correspondence and recent studies by agents of the bureau.

This beetle was first described by Olivier in 1807 from "Carolina." Bureau notes here presented, dating from 1880 to the present time, show it to have been the source of injury at various points in Virginia, North and South Carolina, Georgia, Oklahoma, and New Mexico. It seems to center in point of abundance in eastern North Carolina, extending southward to southern Florida, northward to Maryland, thence northwest to northwestern Illinois, southwest to extreme southeastern Arizona and northern Mexico, and eastward to the Gulf coast. It is essentially a lowland form, as its food plants clearly indicate, swamp and other low-lying lands being particularly subject to attack.

In addition to the cultivated food plants, corn, rice, and peanuts, the species has been found to feed upon *Cyperus strigosus*, *C. vulpinoides*, *C. esculentus*, *C. rotundatus*, *C. exaltatus*, *Tripsacum dactyloides*, *Panicum capillare*, and *Carex frankii*.

Life history notes are given, together with descriptions of the egg, larva, pupa, and adult. The egg period was found to vary from 4 to 6 days in June and July and from 6 to 8 days in September. In one case 58 eggs were secured from one female. In North Carolina the eggs appeared to be deposited from June 1 to September 20, or during a period of approximately 4 months. The eggs are placed in the corn plant above the roots. Upon hatching the larva works downward, through the center of the lower stem and into the main root or taproot and, unless this is entirely eaten away, probably finishes its development there. While the insect is not aquatic, it is capable of living and developing on submerged plants without suffering material inconvenience therefrom. In cornfields it is often found working several inches below the surface of soil thoroughly saturated with water. While the corn is injured by adults and larvae, attacks by the latter are by far the most fatal to the plant.

Studies conducted at Wellington, Kans., show that the larval stage may occupy from 37 to 41 days. The adult beetle is reported to have issued September 1 from a larva which transformed to a pupa August 22. "The adults evidently hibernate to some extent in corn in the chamber in which they have developed, but seemingly lower down than in the case of *S. maidis*. . . . The numbers found, however, were far too limited to indicate that this can be true of even the majority, the others probably wintering over either in or near the surface of the ground. . . . The beetles probably come forth from their hibernation quarters quite early in spring, as soon as the ground has become permanently warm from the spring temperature. . . . They evidently feed for a considerable time by puncturing the lower part of the stems of the plants. These punctures are quite different from the egg punctures, and the effect is often not so fatal as that occasioned by the downward burrowing of the larva. These punctures are usually made about or a little below the surface of the ground, the beetle evidently searching for a point where the stem is tender and succulent. If the punctures are made lower down on the plant just above the root, the result is a throwing up of a number of tillers or suckers from the roots, the main stem itself having a stalky appearance, with the result that no ears are produced."

An instance has come to notice which seems to indicate that the beetles can survive not only in fresh water but also in salt water. The author's attention

was called in the fact that where corn had followed cotton crops no damage was apparent, but where the preceding crop had been corn, the damage was in many cases very severe, often resulting in a total loss of the crop.

The night hawk (*Chordeiles acutipennis tezensis*) and the predaceous maggot of the robber fly *Bras lateralis* are mentioned as natural enemies of this beetle. It appears evident that the beetles winter in the fields where they develop and that crop rotation is effective in preventing serious injury.

Progress and prospects of tick eradication, C. CURTICE (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 255-265, fig. 1; Circ. 187, pp. 255-265, fig. 1*).—In this paper the author briefly discusses the beginning of tick eradication, the results of 6 years' work, obstacles to progress, reasons for tick eradication, and prospects for the future.

In summarizing the eradication work it is stated that at the time of writing "there have been freed of ticks and released from quarantine 127 counties and parts of 20 counties out of 929 originally infected; 90 are in varying degrees of disinfection. Over one-seventh of the counties have been cleaned, and over one-fifth of all the originally infected counties have been worked in. About one-tenth of the counties now infected are being worked in and are partially clean."

The use of arsenical dips in tick eradication, R. H. RANSOM and H. W. GRAYBILL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 267-284, pls. 6, fig. 1*).—This paper is based upon the investigations previously noted (*E. S. R., 27, p. 34*).

A new leakage gage, C. W. WOODWORTH (*California Sta. Circ. 75, pp. 15, figs. 1-4*).—This is the sixth of the author's papers on fumigation studies (*E. S. R., 26, p. 561*).

A new method of determining the leakage in fumigation work, through the use of a leakage gage which the author has invented, is here described. This new gage consists of a tent clamp and a set of 3 tubes, 1 of brass ending in a nipple for attaching a rubber mouthpiece, and the other 2 of glass, along 1 of which is a scale so graduated as to show the percentage of leakage, and a small glass chamber of water with which the 3 tubes communicate. The graduated tube is closed at the top but has a passage to the clamp ring which allows air to pass through the tent cloth. The other glass tube is open at the top.

The method of determining leakage is as follows: The glass chamber is filled partly full of water and a double thickness of the tent is clamped into the clamp ring, the tester blows gently through the rubber mouthpiece on the brass tube until the water rises to the top of the open glass tube, then the percentage of leakage is read on the scale where the top of the water column reaches in the closed glass tube.

The theory upon which most methods of measuring leakage is based is that the rates of leakage of gas through different pieces of cloth will show approximately the same difference that is found between the rates of flow of air through these cloths when it is forced through under the same pressure. The method used in this apparatus is to measure the resistance to the passage of air presented by the cloth to be tested as compared with an opening of a known size. The scale is graduated between 0 and 100 per cent leakage by testing in the gage a series of metal disks containing holes of different known area and determining the ratio of their areas to the area of the clamp ring.

Pressure gages for determining leakage were found to be more practical than volume gages, a test tube gage being the simplest form of pressure gage. A suction gage, which was the most satisfactory form used in the laboratory, requires a special form of regulating clamp. The use of a tester enables one

to be sure of the proper adjustment of the instrument. A combined instrument, containing both tent, clamp and gage, is recommended for field work.

Leakage through the weave of the cloth was found to be much more important than that through visible holes.

Other phases discussed are the method of stating leakage and leakage in torn tents.

### FOODS—HUMAN NUTRITION.

Economic results of cold storage, JAMES WILSON (*U. S. Dept. Agr. Rpts. 1911, pp. 25-34*).—A special investigation was undertaken by this Department, in which detailed information regarding the cold storage industry was collected by means of schedules submitted to the cold storage warehousemen, and prices were compiled from the literature of the subject for the last 80 years. The particular object was to secure data regarding fluctuations in prices before cold storage existed or was of considerable importance, and to compare such data with fluctuations in recent years during which the business has grown to large proportions. On the basis of the information collected, such questions are considered as the length of time commodities remain in storage, the principal months when they are received, the percentage held for longer than a year, the average length and the costs of storage, the tendency to uniformity of prices throughout the year, speculation, and stored goods as a percentage of consumption.

In 1910-11, 47 per cent of the fresh beef placed in cold storage during the year was received during September, October, and November; similarly, 59.8 per cent of the fresh mutton was received during August, September, and October; 59.2 per cent of the dressed poultry during November, December, and January; 70 per cent of the butter during June, July, and August; and 79.4 per cent of the eggs during April, May, and June. As regards delivery, "the important observation to be made is that the receipts into cold storage are entirely or very nearly exhausted by the deliveries within 10 months."

With respect to costs of storage, "it is evident that as the time of storage lengthens, the costs and their percentage of the wholesale price must be multiplied by the number of months. If the storage is for 15 months, for instance, the cost per pound ranges from 5.273 cts. for fresh mutton to 8.572 cts. for butter, and is 8.898 cts. per dozen for eggs; the costs for 15 months range from 36.5 per cent of the wholesale price in the case of butter to 57.5 per cent in the case of fresh mutton. For the average length of time in cold storage, as ascertained in this investigation, the actual costs are for fresh beef, 0.997 ct. per pound; fresh mutton, 1.564 cts. per pound; fresh pork, 0.35 ct. per pound; for poultry, 1.079 cts. per pound; for butter, 2.532 cts. per pound; for eggs, 3.505 cts. a dozen. The costs of storage for the average length of time are 7.9 per cent of the wholesale price for fresh beef; 17.1 per cent for fresh mutton; 3.2 per cent for fresh pork; 6.8 per cent for poultry; 10.8 per cent for butter; and 18 per cent for eggs. Approximately, the wholesale prices of the commodities mentioned are increased by cold storage to the extent of the percentages just given."

Cold storage has influenced considerably the relative monthly consumption of commodities and has made it more even throughout the year. "There has also been a change in relative monthly prices, due to cold storage. In the case of eggs the relative price has increased in the season of natural plenty and diminished in the period of natural scarcity. . . . In the cases of both butter and eggs the annual price level has been raised by cold storage, for a reason apart from the costs."

With respect to the tendency to uniform prices throughout the year, an examination of the data collected regarding the range of prices indicates "a tendency toward uniformity of prices with regard to butter, eggs, poultry, and fresh mutton, and a tendency away from uniformity with regard to fresh beef and fresh pork."

With regard to the extent of the cold storage enterprise, the report points out that "this business of storing foods has grown to such proportions that consumers have a rightful concern with its management for economic as well as sanitary reasons. From the returns made to this Department by the cold-storage warehousemen, it is inferable that the fresh beef, fresh mutton, fresh pork, poultry, butter, eggs, and fish received into cold storage in a year amounts to a weight of at least 1,000,000,000 pounds and very likely to a quarter of a billion more. The eggs received into storage in a year are approximately 13½ per cent of the farm productions; the fresh beef is over 3 per cent of the census commercial slaughter of cattle; mutton over 4 per cent of that slaughter of sheep and lambs; fresh pork 11½ per cent of that slaughter of hogs; and butter 25 per cent of the creamery production."

From the investigation as a whole, the following recommendation is made with reference to publicity: "This is no indictment of the men who keep foods in cold storage except in so far as they sometimes speculate, nor need they be indicted for offenses in order that the public economic interest in their business may be made to appear. . . . The man who places food in cold storage is somewhat in the situation of the man who forestalls the market. He may not attempt to do so, but the power may be a temptation.

"The affairs of such a business as this should have publicity. The public ought to know how much goods are in storage from month to month and what the movements of receipts and deliveries are.

"The food warehousemen should be required to send to Washington monthly reports containing the desired information. Here these reports could be promptly aggregated and the results could be given to the public on a previously announced day of the month, somewhat as the crop reports are."

An inquiry into the cost of living in Australia, 1910-11, G. H. KNIBBS (*Noted in Jour. Soc. Statis. Paris, 53 (1912), No. 3, p. 163*).—Statistics regarding the expenditures of 212 Australian families with an average income of \$100 per month are here summarized. The weekly expenditures for food for individuals of different age and sex are found to stand in practically the same proportion to each other as the figures given by Atwater to represent the relative nutritive demands of individuals of different age and sex.

[Food analyses and other pure food and drug topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 2 (1912), Nos. 2, pp. 17-32; 3, pp. 33-48*).—The first of these bulletins contains data regarding the registration of beverages, the examination of crackers, biscuits, and similar goods, miscellaneous food-products, and proprietary articles, and a discussion of a number of matters relating to pure foods.

The second bulletin contains some data regarding the registration of beverages, the examination of kippered herrings from a corroded can with reference to the tin, lead, and zinc present, analyses of "crisco," a commercial fat, and canned goods, the examination of miscellaneous food products, and analyses of waters.

A paper by T. Sanderson reports a comparison of the milling quality of samples of hard red spring wheat and hard red winter wheat. The data showed that from a milling standpoint the winter wheat is superior to the spring wheat and produces the largest amount of flour per bushel, with the smallest loss in milling. 2 types of wheat, it is noted, are very similar in their general

characteristics, so much so that they require about the same treatment during tamping and milling. The growing of some winter wheat is recommended.

A comparative test is also reported of the baking strength of northern grown hard red winter wheat and hard red spring wheat. The results showed that the spring wheat produced a bread slightly superior as regards absorption, baking strength, color, texture, and protein content of wheat and flour, the greatest differences being with respect to baking strength (loaf volume) and protein content. The results as a whole are not regarded as unfavorable to the winter wheats.

The bulletin also reports a test by R. E. Remington on the immersion refractometer as a rapid means of approximating the solids in vinegar (see page 112), and discusses miscellaneous pure food topics.

**Studies on wheat flour.**—I. Influence of the concentration of hydrogen ions on the baking value of flour, H. JESSEN-HANSEN (*Compt. Rend. Lab. Carlsberg*, 10 (1911), No. 1, pp. 170-206, *dgms.* 4).—The well known fact that the acid content of flour exerts an influence, not only on the specific gravity of bread but even more on its general quality, led the author to the conclusion that there exists an optimal concentration of hydrogen ions for the baking value of flour in general, or, in any case, that such concentration is capable of explaining the different properties which make up the baking value of flour. To test this theory, he conducted a series of baking tests with different flours, the conclusions being drawn from the average for 12 loaves in each case. The work is not yet complete, but on the basis of that accomplished, the author presents the following conclusions:

The optimal concentration corresponds approximately to the expanding of hydrogen ions  $ph=5$ . For the fine flours it is slightly higher; for the poorer varieties slightly lower.

Of the different milling products from the same grain, the finest flour, that is, that coming from the central portion of the grain, presents the greatest acid, or the greatest concentration of hydrogen ions, while the bran, which is the least acid, presents the least concentration of hydrogen ions.

The various artificial methods of improving the baking quality of flour which have been advanced recently have practically no other effect than that of increasing the concentration of hydrogen ions in the dough.

Measuring the gluten extracted by washing is deemed of no value in determining the baking value of a flour.

**The proteins of rice**, S. KAJIURA (*Bio-Chem. Jour.*, 6 (1912), No. 2, pp. 171-181).—The article reports unfinished studies on the proteins of rice, from which the following conclusions are drawn:

• "The proteins of 'white rice,' as used for dietary purposes in Japan, consist only to the smallest extent of albumins and globulins. The amount of alcohol-soluble protein is practically negligible, thus distinguishing rice sharply from all other cereals hitherto investigated. The main protein of rice, oryzenin, belongs to the glutenin class (proteins soluble in dilute alkali). In its nitrogen partition it differs from wheat glutenin (the only other glutenin so far studied) very considerably."

**The toxicity of caffeine**—an experimental study on different species of animals, W. SALANT and J. B. RIEGER (*U. S. Dept. Agr., Bur. Chem. Bul.* 148, pp. 98).—The results are reported of an extended experimental study with rabbits, guinea pigs, cats, and dogs of the toxicity of caffeine administered by mouth, by subcutaneous injection, and injection in other ways. There is also a historical review of the literature of the toxicity of caffeine and a bibliography.

The report is the first of a proposed series, and it is pointed out that the conclusions are in some particulars to be regarded as tentative.

Conclusions from the authors' summary follow:

"The toxicity of caffeine in the rabbit varies with the mode of its administration, being least when given by mouth and greatest by intravenous administration. The toxicity is from 15 to 20 per cent greater by subcutaneous injections than by mouth, but is about half of that when injected into the peritoneal cavity.

"The resistance of the guinea pig to caffeine, as of the rabbit, is greatest when given by mouth. . . . The adult cat is less resistant than the guinea pig or rabbit to caffeine. . . . The minimum fatal dose for dogs was found to be the same by mouth as by subcutaneous injection and is almost the same as for the cat. The toxicity of caffeine varies in the guinea pig according to season of the year.

"Age is likewise a factor in the toxicity of caffeine, young animals being more resistant than the full-grown and older animals; this was shown in experiments on rabbits, cats, and dogs. The symptoms of caffeine poisoning also were different in puppies and in full-grown dogs. Different diets, such as carrots and oats, did not influence the resistance of rabbits and guinea pigs to caffeine. Low protein diet tends to decrease resistance to caffeine in dogs. Young growing dogs are less resistant to caffeine on a meat than on a milk diet. Caffeine is not cumulative in the rabbit or dog, even if administered for a considerable length of time. Some degree of tolerance may be induced in the rabbit under certain conditions, but not in dogs under the conditions of the experiments made in this investigation. . . . The toxicity of caffeine is probably increased under pathological conditions, since comparatively smaller doses were fatal to rabbits, cats, and dogs, when marked lesions not due to caffeine were found at autopsy. Glycosuria was observed in rabbits, guinea pigs, and cats when caffeine was given in sufficient amounts."

See also a previous note (E. S. R., 25, p. 470).

Coca cola (sirup), A. MCGILL (*Lab. Inland Rev. Dept. Canada Bul. 232, 1912, pp. 11*).—A summary of the analyses of 68 samples of the sirup made to determine their cocaine and caffeine content is given. No trace of cocaine was found in any, while the amount of caffeine varied from 0.15 to 0.72 of a grain per ounce, the average being 0.60.

State and municipal meat inspection and municipal slaughterhouses, A. D. MELVIN (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 241-254, dgms. 4; Circ. 185, pp. 241-254, dgms. 4*).—Inasmuch, as is stated, only a little more than one-half of the total meat supply of the United States is subject to the Federal inspection, the need for State or local inspection is pointed out, and the problems of local inspection are discussed. The municipal or central slaughterhouses recently erected in Paris, Tex., and Nashville, Tenn., are described and plans and specifications given for a central abattoir and septic tank.

The hourly chemical and energy transformations in the dog, after giving a large quantity of meat, H. B. WILLIAMS, J. A. RICKE, and G. LUSK (*Amer. Jour. Physiol., 29 (1912), No. 4, Proc. Amer. Physiol. Soc., 24 (1911), pp. XXXIII, XXXIV*).—The experiments here reported were carried out in a calorimeter of the Atwater-Rosa type. A dog fed 700 gm. of meat at noon of the previous day was placed in the calorimeter chamber between 10 and 11 a. m., and his metabolism measured. At 12 m. the animal was given 1,200 gm. of meat and again placed in the apparatus. The heat production and other factors of metabolism were determined hourly for 20 hours.

"It was found that the direct and the indirect calorimetry agreed perfectly.

"It was found that the heat production rose largely, and that this increase in heat production was proportional to the nitrogen eliminated in the urine, and

was in no way proportional to the quantity of material present in the intestine. It was found that the carbon which was retained from the protein ingested must have been retained in the form of glycogen, since the absorption of oxygen during the different periods corresponded exactly with this assumption, whereas, if the carbon had been retained in the form of fat, the oxygen absorption would have been 10 per cent less than that found.

"Further experiments have shown that glutamic acid added to a standard diet does not increase the heat production in any way."

Investigations on the digestion of milk—gastric digestion of casein, L. GAUCHER (*Compt. Rend. Soc. Biol. [Paris]*, 72 (1912), No. 9, pp. 354-355).—Continuing previous work (E. S. R., 26, p. 662), the author studied the digestion of artificially separated casein in a dog with a duodenal fistula. Comparing the results with those of normal human digestion, he concludes that the digestion of casein corresponds to the final stage of the digestion of milk. He summarizes the process of normal milk digestion as follows:

Of 7 gm. of casein absorbed with 250 cc. of milk, 4 gm. passes immediately from the stomach in a liquid state, and 1 gm. in the form of a loose clot, while the remaining 2 gm. contracts and hardens rapidly. Energetic gastric movements are necessary to reduce them to a purée, under which form they leave the stomach from 1 to 1½ hours after ingestion.

Calcium absorption in the animal body from pasteurized and sterilized milk, J. ZIMMER (*Ueber Kalkresorption im Tierkörper bei Verwendung von pasteurisierter und sterilisierter Milch. Inaug. Diss. [Univ.], Strassburg, 1911, pp. 12; abs. in Hyg. Rundschau, 22 (1912), No. 6, p. 364*).—Two dogs were fed with pasteurized, 2 with sterilized, and 3 with raw milk. The animals were killed from 2 to 2½ hours after the meal and the amount of calcium in the contents of various portions of the intestines was determined. The results do not indicate that these methods of treating milk greatly affect the amount of calcium assimilated.

Studies on water drinking.—XII, On the allantoin output of man as influenced by water ingestion, L. T. FAIRHALL and P. B. HAWK (*Jour. Amer. Chem. Soc.*, 34 (1912), No. 4, pp. 546-550).—Continuing previous work (E. S. R., 26, p. 360), the authors conducted experiments summarized as follows:

"When the diet of a normal man was supplemented by 900 cc. of water per day the average daily output of allantoin . . . was 0.0135 gm. for a period of 13 days. Upon increasing the water intake to 3,450 cc. per day for a period of 5 days, the average daily allantoin excretion was increased to 0.0173 gm. This constitutes an approximate 20 per cent increase. The daily value for a 5-day final period on the original 900 cc. water ingestion was 0.0122 gm.

"The increase in the allantoin output accompanying water drinking may indicate that the oxidative mechanism of the organism has been stimulated through the introduction of the large volume of water into the body, and that purin material which would ordinarily have been excreted in some less highly oxidized form has been oxidized to allantoin and excreted in this form. This interpretation is strengthened by the finding in this laboratory of a decreased uric acid output after the water ingestion of the subject (man) had been considerably increased.

"In view of the fact that the above interpretation is contrary to the current views regarding purin metabolism in the human organism, the authors make the interpretation tentatively until further experiments may be completed."

The utilization of yeast in the human organism, W. VÖLKE and A. BAUDREXEL (*Biochem. Ztschr.*, 30 (1911), No. 6, pp. 457-472; 31 (1911), No. 3-4, pp. 355-357; *abs. in Hyg. Rundschau, 22 (1912), No. 4, p. 245; Ztschr. Untersuch. Nahr. u. Genussmitt.*, 23 (1912), No. 4, 174).—When 100 gms. of deac-

ated yeast from which the bitter principle had been removed by treatment with soda was added to a basal ration in a digestion experiment with a man, 86 per cent of the protein from the yeast was resorbed and 88 per cent of the energy utilized. The calculated physiological nutritive value was 74.8 per cent of the total energy. The coefficients of digestibility were organic substances 90, fat 70, cellulose 40, and nitrogen-free extract 100 per cent.

The place of retention or reconjugation of the amino acids in the body, A. WOLFE (*Amer. Jour. Physiol.*, 29 (1912), No. 4, *Proc. Amer. Physiol. Soc.*, 24 (1911), pp. XXXVIII, XXXIX).—Dogs, which had been operated on a few days previously for Eckfistula, were used in these experiments. Their hepatic arteries were tied, and solutions of amino acids introduced into their washed out intestines.

All the urine excreted was collected and the animals bled completely. The blood was defibrinated and centrifuged, and the serum thus obtained had its albumin removed and was otherwise prepared for formol titration to test it for an increase in its amino nitrogen content over normal serum. The ammonia and the amino nitrogen in the urines were determined.

"The small increases of amino nitrogen in the blood and the small increases of formol titratable nitrogen in the urines were far from commensurate with the amounts of amino acid shown by determination to have been absorbed by the intestine. . . .

"That the amino acids are not removed from the blood with the fibrin in the defibrination, or that some constituents of the plasma or the blood corpuscles are not responsible for their disappearance, was shown by control determination.

"Tissues other than the liver, intestinal mucosa, and blood cells can take up amino acids from blood plasma. Since the tissues in general seem to have such an avidity for amino acids, it is fair to suppose that in them the amino acids can be utilized for the regeneration of albumins."

The physiology of phosphorus during growth, A. LIPSCHÜTZ (*Pfänger's Arch. Physiol.*, 143 (1911), No. 1-3, pp. 91-98).—Basing his opinion on experiments with young dogs fed a diet low in phosphorus, the author concludes that the growing organism is able to make use of all available phosphorus, whether it is supplied in small quantities by the food or deposited in the less important organs of the body.

Biological significance of casein phosphorus for the growing organism, A. LIPSCHÜTZ (*Pfänger's Arch. Physiol.*, 143 (1911), No. 1-3, pp. 99-108).—The author conducted experiments with growing dogs whose food contained no phosphorus except that supplied by casein. In his opinion the work is too incomplete to be conclusive, but indicates that the growing organism can obtain the inorganic phosphorus necessary for its supply from the organic phosphoric acid resulting from the cleavage of casein.

Microscopic studies on living smooth muscle, E. B. MEIOS (*Amer. Jour. Physiol.*, 29 (1912), No. 4, *Proc. Amer. Physiol. Soc.*, 24 (1911), pp. XIV, XV).—The experiments reported were made with amphibians and were intended to throw light on the question whether smooth muscle cells decrease in volume during contraction; the results "confirm this view."

The chemical constituents of the ash of smooth muscle, L. A. RYAN and E. B. MEIOS (*Amer. Jour. Physiol.*, 29 (1912), No. 4, *Proc. Amer. Physiol. Soc.*, 24 (1911), pp. XV, XVI).—The smooth muscle of the bullfrog's stomach was analyzed for potassium, sodium, phosphorus, and chlorin, together with parallel analyses of the ash of striated muscles from the same frogs. "The work indicates that smooth muscle contains somewhat less potassium and phosphorus and somewhat more sodium and chlorin than striated muscle, but the differences are much less marked than has sometimes been supposed.



"The chemical work was supplemented with microscopic study of fixed and fresh samples of the tissue analyzed as 'smooth muscle,' and it was found that 70 per cent to 85 per cent of its volume was smooth muscle fibers; about 5 per cent, extraneous connective tissue; and the remainder, interstitial spaces between the muscle fibers."

### ANIMAL PRODUCTION.

Chemical investigations on maize silage, D. FEBUGLIO and L. MATTEI (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata*, 3 (1909-10), pp. 65-90).—Analyses of green maize and silage are reported.

The green forage contained 79.295 per cent of water. The other constituents on a dry-matter basis were as follows: Crude protein 8.419, pure protein 4, ether extract 2.173, invert sugar 14.296, sucrose 2.511, amids 1.96, pentosans 20.686, cellulose 28.248, ash 7.05, undetermined obtained by difference 12.88, and acidity 1.777 per cent.

The silage contained 78.77 per cent of water. The other constituents on a dry-matter basis were as follows: Crude protein 8.562, pure protein 2.56, ether extract 5, invert sugar 4.701, sucrose 0.273, amids 1.1, pentosans 19.13, cellulose 27.758, ash 6.4, undetermined obtained by difference 20.171, and acidity 6.905 per cent.

Ensilage of fodder, roots, and beet pulp.—Use of lactic ferments, L. MALPEAUX and G. LEFORT (*Jour. Agr. Prat.*, n. ser., 20 (1911), Nos. 42, pp. 488-490; 44, pp. 549, 550; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 1, pp. 195-200).—The authors report experiments in fermenting beet pulp, distillery pulp, sliced mangolds, beet leaves, and corn silage with the ferment known as lacto-pulp. In the majority of cases there was a loss in nutrient elements, but the food was kept free from putrid ferments and in a sound condition both from the dietetic and hygienic point of view.

The actual state of our knowledge of silage, D. FEBUGLIO (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata*, 3 (1909-10), pp. 55-63).—This is a review of recent investigations on this topic.

On the composition of hay damaged by rain, G. PATUREL (*Jour. Agr. Prat.*, n. ser., 23 (1912), No. 17, pp. 524-527).—A number of analyses of damaged alfalfa, clover, and common hay showed a loss of from 15 to 35 per cent in dry matter. A feeding test also indicated a proportionate loss in nutritive value.

Chemical analyses of licensed commercial feeding stuffs, 1911, F. W. WOLL (*Wisconsin Sta. Circ. Inform.* 30, pp. 98).—This is a report of the feeding stuffs control for the year. Analyses are reported of oil meal, cotton-seed meal, cotton-seed cake, gluten feed, dried distillers' grains, hominy feed, wheat bran, standard middlings, flour middlings, red dog flour, germ middlings, mixed mill feed, rye feed, rye bran, wheat, oat, and rye middlings, barley shorts, buckwheat feed, buckwheat hulls, ground corn and oats, corn, oats and barley, dried brewers' grains, malt sprouts, alfalfa meal, mixed feeds, dent corn, sweet corn, corn cobs, ground oat hulls, crushed oats, wheat screenings, pigeon grass seed, flax screenings, salvage barley, salvage grain, cull beans, pea feed, pea hulls, corn silage, green corn, green oats and peas, sorghum refuse silage, alfalfa hay, clover hay, western prairie hay, and brush feed.

Licensed commercial feeding stuffs, 1912, F. W. WOLL (*Wisconsin Sta. Circ. Inform.* 31, pp. 13).—A list of licensed manufacturers of concentrated commercial feeding stuffs for the calendar year ending December 31, 1912.

Results of the examination of stock feeds, B. L. PURCELL (*Ann. Rpt. Dairy and Food Com. Va.*, 3 (1910-11), pp. 128-146).—Analyses are reported of bran, whole wheat hominy feed, corn-oil meal, corn meal, cracked corn, gluten feed, wheat meal, oil meal, rye middlings, rye feed, shorts, wheat middlings, red clover hay, and mixed feeds.

Kansas feeding stuffs law, E. H. WEBSTER (*Kansas Sta. Circ.* 18, pp. 7).—This contains the text of the Kansas feeding stuffs law as revised in 1911, and an explanation of the law and the changes made in it.

The world's greatest meat market (*Breeder's Gaz.*, 61 (1912), No. 12, pp. 706, figs. 2).—This article describes the methods of marketing at the Smithfield market, London, and discusses the dressed meat trade of Great Britain.

"Approximately a fifth of the meat sold at Smithfield is domestic product." "Occasionally a little American mutton dribbles into Smithfield, but like American beef it promptly loses its identity." "Pork is displayed in enormous quantities in Smithfield, but it is mainly a showing of pigs, Danish and Holland contributions predominating." "Despite the growing paucity of American product displayed at Smithfield, the big Chicago slaughterers are conspicuously in the trade. One hears much of American control, but the proportion of the market business transacted by others is overwhelmingly large."

Miscellaneous information concerning the live-stock industry, J. ROBERTS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 439-524).—This information includes a review of the live-stock market in 1910, meat prices at home and abroad, foreign trade in animals and animal products, legal standards for dairy produce, contagious diseases of animals in foreign countries, and a list of state live-stock sanitary officials.

The live-stock industry of Honduras, W. THOMPSON and J. E. DOWNING (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 285-295, pls. 4, fig. 1).—A popular account of information obtained by representatives of this Department, who made a tour of Honduras in order to obtain information to enable the Department to determine whether or not the importation of cattle from Honduras could be permitted under the law which prohibits the importation of live stock which are diseased, or have been exposed to infectious diseases within 30 days before the exportation.

The country is considered a good stock country as a whole, but the stock kept is poor and the methods are primitive. Three-fourths of the cattle in the country are raised in the departments of Choluteca and Olancho. Although some improved breeds have been imported, the greater part of the cattle are descendants of original stock imported from Spain and resemble the old Texas cattle. Bananas have been found to be a cheap and satisfactory food for fattening. The chief drawbacks are the lack of established markets in the provinces, the tick, and transportation facilities.

It was concluded that as southern fever and the cattle tick are prevalent throughout Honduras the importation of cattle to the United States could not be permitted.

Live-stock breeding in Uruguay, O. GUTH (*Rev. Asoc. Rural Uruguay*, 40 (1911), No. 3, pp. 668-679; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Int. and Plant Diseases*, 3 (1912), No. 1, pp. 206, 207).—A general account of the cattle and sheep industry.

Circuit breeding (*Amer. Breeders Mag.*, 3 (1912), No. 1, pp. 57-62).—An editorial which discusses the method of organizing breeding circuits, and the results which have been obtained where they have been formed.

The principles of breeding and the origin of domesticated breeds of animals, J. C. EWART (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 125-186, pls. 7, figs. 7*).—This comprises lectures given at the Fourth Graduate School of Agriculture, 1910.

Under the principles of breeding the author discusses such problems as line breeding, inbreeding, cross fertilization, reversion, effect of environment, maternal impression, telegony, transmission of acquired characters, Galton's ancestral law, and Mendel's law.

As an illustration of crossing distinct types the author reports an experiment in crossing a Mexican dog of the Chihuahua breed and a West Highland terrier. Another experiment is cited to show how a loss of vitality resulted by inbreeding goats. Other experiments, and the author's views on the origin of domesticated cattle, horses, and sheep, have been previously noted from other sources. It is pointed out that a knowledge of the history of the origin and characters of the breeds of domestic animals is a great advantage to those who undertake breeding experiments.

In conclusion the author states that, in order to improve breeding stock, "breed the best to the best, but avoid crossing different strains and different types of the same strain, and, as a rule, avoid close affinities."

The ancestry of domesticated cattle, E. W. MORSE (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 187-239, pls. 3, figs. 8*).—This article includes lectures given at the Fourth Graduate School of Agriculture, 1910, and is a summary of the literature on this subject. There are brief historical sketches of the Bovidae, the genus *Bos*, and the cattle bred by the early inhabitants of Asia, Northern Africa, and Europe. There is a critical discussion of different extinct species which may be the possible ancestors of the domesticated breeds in Europe and America. The classifications of breeds proposed by the different authorities are given, and a bibliography is appended.

[Cattle in Jamaica], H. H. COUSINS ET AL. (*Bul. Dept. Agr. Jamaica, n. ser., 2 (1912), No. 5, pp. 27-49, pls. 13*).—An account of the introduction and present status of the zebus, Red Polls, Jerseys, and grade Guernseys and Jerseys which have been imported to the island of Jamaica.

Brazilian Caracú cattle, N. ATHANASSOF (*Estudo sobre o gado Caracú. São Paulo: Govt., 1910, pp. IV+155, pls. 15, figs. 95; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 2 (1911), No. 6, pp. 1405, 1406*).—An account of the characteristics of different breeds of cattle in São Paulo. Methods of management, body measurements, and statistical data are given.

Cattle breeding in Latium, A. STAZI (*Bol. Quind. Soc. Agr. Ital., 16 (1911), No. 23, pp. 901-911; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 474-476*).—This contains information on the state of cattle breeding, meat prices, and slaughter weights.

Experimental studies on cattle and pigs carried out at the Royal Zootechnical Institute of Reggio Emilia, A. ROMOLORI (*Studi Sperimentali Compiuti sui Bovini e Suini al R. Istituto Zootecnico di Reggio Emilia. Reggio Emilia, 1911, pp. 1-30; abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases, 3 (1912), No. 2, pp. 471-474*).—These studies report data on the increase in weight of cows during 9 months of gestation, the weight of the fetus at birth in relation to the live weight of the mother, the birth weight of Simmental-Reggiano calves, the weight of Simmental and Swiss calves at 1 year, the state of the teeth in calves at birth, and related topics.

Studies of the nutrition of the pig, E. V. MCCOLLUM and H. GREENWOOD (*Wisconsin Sta. Research Bul. 21, pp. 53-86, figs. 5*).—This bulletin consists of

articles, namely, Notes on the Creatinin Excretion of the Pig; Nature of the Repair Processes of Protein Metabolism; and A Metabolism Cage for the Pig. The first 2 articles have been previously noted from other sources (E. S. R., 26, pp. 350, 364). In the third article the advantages of using the pig for metabolism experiments are pointed out, and the details for constructing a metabolism cage for pigs are given.

The production of "hothouse" lambs, E. S. SAVAGE and G. W. TAILBY, JR. (*New York Cornell Sta. Bul. 309*, pp. 231-255, pl. 1, figs. 14).—This presents the results of 3 seasons' experience in the production of "hothouse" lambs. Part 1 deals with the care, management, and methods of slaughtering as practiced at the station. Part 2 contains records of the flock and products obtained. Part 3 contains tabulated data on market quotations, birth weights, slaughter weights, gains made, cost of gains, and selling prices for each breed. Some of the results are summarized in the following table:

Data on production of hothouse lambs.

Breed.	Number of lambs.	Average birth weight.	Average gain.	Average gain per day.	Average selling price.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	
Dorset.....	46	9.3	39.6	0.54	\$8.06
Grade Dorset.....	14	9.4	39.0	.55	9.07
Hampshire.....	4	9.7	37.8	.61	6.88
Cotswold.....	9	10.5	37.9	.61	6.55
Rambouillet.....	30	9.8	37.3	.52	7.73
Cheviot.....	23	8.3	37.5	.49	6.49
Grade Cheviot.....	16	9.8	38.1	.59	8.22
Delaine.....	30	10.0	36.6	.47	7.73
Southdown.....	19	9.7	38.5	.53	7.26
Grade Southdown.....	26	9.3	39.0	.49	6.90
Shropshire.....	13	10.0	37.5	.57	7.42
Grade Shropshire.....	31	9.1	37.2	.50	7.03

Evolution of the standard bred, F. R. MARSHALL (*Amer. Breeders Mag.*, 3 (1912), No. 1, pp. 45-51).—This article consists of historical notes, which illustrate the rôle of selection in the improvement of breeds. The author is of the opinion that speed is probably the result of many contributing factors which, when analyzed, may prove to be unit characters inherited in Mendelian fashion.

Great sires of a hundred years, W. GILBEY (*Live Stock Jour. Almanac* [London], 1912, pp. 46-56, figs. 8).—Brief notes on famous sires of the different breeds of horses and ponies which originated in Great Britain are presented.

The army remount problem, G. M. ROMMEL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 103-124, pls. 5; *Circ. 186*, pp. 103-124, pls. 5).—It is pointed out that although the mounted service of the U. S. Army is now being furnished in a fairly satisfactory manner with horses purchased and developed under the remount system, the price of remounts is high. The plan devised by this Department and the War Department, previously noted (E. S. R., 25, p. 374), to encourage the breeding of horses is deemed necessary, because horses of the proper type are not sufficiently numerous to supply the army in case of war, and the time may soon come when it will be difficult to supply those needed in time of peace.

Previous to the Civil War most of the horses bred in the United States were of the light type, but in the last 40 years the heavy draft horse has been bred for farm use. Although the number of horses has increased, the proportion suitable for remounts has appreciably decreased.

There is a brief account of the mounted service in the militia and of police in large cities. Specifications for saddle horses purchased in 1910 for the use of the New York mounted police, a brief account of the horse breeding work of this Department, and an outline of the plan for encouraging the breeding of horses for the army, are also given.

The restricted climatic environment of horses, C. E. WOOLSTY (Jour. U. S. Cavalry Assoc., 22 (1912), No. 90, pp. 1086-1103).—The significance of size, immunity to disease, coat color, and skin pigments in adapting horses to different climates is discussed. It is stated that a military horse fit for campaigning in all climates can not be bred, as he must be able to live in the open with little or no shelter.

Watering the heated horse, W. P. HILL (Jour. U. S. Cavalry Assoc., 22 (1912), No. 90, pp. 1017-1020).—It is maintained that it is a fallacy to believe that it is harmful for a heated horse to drink water, as large amounts may be drunk if the temperature of the water is not cold enough to chill the horse.

Pigeon culture as an agricultural industry, V. P. GONCHAROV (Ezhg. Dept. Zeml. [Russia], 1910, pp. 452-544, pls. 10, figs. 13).—The author describes the different varieties of pigeons, and discusses breeding, housing, feeding, and marketing. A bibliography of Russian and other publications, including periodicals devoted to pigeon culture, is appended.

Domestication of the fox, B. I. RAYNER and J. W. JONES (Amer. Breeders Mag., 3 (1912), No. 1, pp. 37-45, figs. 3).—An account of the silver fox industry in Prince Edward Island, where there are at present about 80 ranches stocked with about 200 fine dark silvers, 300 silver-grays, and 400 light silvers, the total skin value amounting to about \$550,000, and breeding stock estimated at about \$1,500,000 at current prices. The methods of feeding, management, and sale of furs are discussed.

Biological investigations on pregnancy, E. ANDERHALDEN and M. KRUTS (Hoppe-Seyler's Ztschr. Physiol. Chem., 77 (1912), No. 4, pp. 249-258).—A preliminary note on experiments in the use of biochemical methods for diagnosing pregnancy in horses, rabbits, and guinea pigs.

The experimental production of the maternal placenta and the function of the corpus luteum, L. LOEB (Jour. Amer. Med. Assoc., 53 (1909), No. 18, pp. 1471-1474; Med. Rec. [N. Y.], 77 (1910), No. 26, pp. 1083-1087; Zentbl. Physiol., 24 (1910), No. 6, pp. 203-208; Proc. Soc. Expt. Biol. and Med., 7 (1910), No. 4, pp. 90, 91; Deut. Med. Wchnschr., 37 (1911), No. 1, pp. 17-21; Arch. Entwickl. Mech. Organ., 51 (1911), pt. 3, pp. 456-478, figs. 2; Zentbl. Physiol., 25 (1911), No. 9, pp. 336-343).—A series of studies on ovulation and related topics. The maternal placenta could be produced artificially in guinea pigs by the introduction of foreign bodies. The function of the corpus luteum was thought to be that of synthesizing the uterine mucosa and to prevent ovulation in pregnant animals. Also, by delaying the rupture of the follicle even in nonpregnant animals the sexual period is prolonged.

The size of the cell as a factor in form and function of domesticated animals, K. VON DER MALSBERG (Arch. Deut. Gesell. Züchtungsk., 1911, No. 10, pp. 367, pls. 27).—Following a discussion of some biochemical, physical, and morphological characters of cells, the author gives the average measurements of the diameter of striated muscle fibers of horses, cattle, and sheep.

In his opinion there is a correlation between the size of the muscle cells and the different species, breeds, and types of live stock, although this is influenced more or less by food, climate, and other ecological factors. He, therefore, suggests the use of these average measurements as "histo-biological symbols" for the different types and breeds of stock.

The false rib, A. BORGEAUD (*Terre Vaud*, 3 (1911), No. 50, pp. 455, 456; *abst. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 2, pp. 458, 459).—A critical discussion of the views of Bieler and Pagès, who consider that an abnormal number of floating ribs is a sign of a good dairy cow, but a fault to be avoided in draft and meat animals.

Notes on heredity, W. J. SPILLMAN (*Amer. Nat.*, 45 (1911), No. 536, pp. 507-512; 46 (1912), Nos. 542, pp. 110-120; 543, pp. 163-165; 545, pp. 309-312).—The author reviews the recent work of Doncaster, Morgan, Loeb, Gortner, and others who have reported investigations on inheritance in plants and animals, as previously noted.

The general trend of the problems of development and inheritance, A. GUEL (*Zool. Jahrb., Abt. Allg. Zool.*, 31 (1912), No. 3, pp. 303-518).—A discussion of the problems connected with embryology or the development of the individual, and inheritance or the development of the race.

Darwinism and human life, J. A. THOMSON (*London*, 1911, pp. XII+251, pt. 1).—This book contains a series of lectures, given before the South African Association for the Advancement of Science in 1909, and which treat principally of the factors concerned in variation and heredity. A bibliography of books on heredity, variation, and evolution is appended.

The value of pedigree, J. WILSON (*Live Stock Jour. Almanac [London]*, 1912, pp. 104-106).—The value of knowing the pedigrees of breeding animals is pointed out, although a long pedigree is no guaranty that invariably the offspring will possess the qualities of near or remote ancestors. Though not so stated, the applications of Mendel's law in breeding horses and cattle are illustrated by a number of examples, and formulated into general principles, as follows:

"We now know that most characters that make stock what they are run in pairs, a masking and a masked character." "It is easy to eliminate a masking character, but difficult to breed it pure, and it is difficult to eliminate a masked character, but easy to breed it pure."

A new method of proving Delbœuf's law, H. HUGUET and A. LHOSTE (*Rev. Vét. [Toulouse]*, 36 (1911), No. 10, pp. 605-614; *abst. in Internat. Inst. Agr. [Rome]*, *Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 1, pp. 202-204, pt. 1).—A new method of proving mathematically that however large may be the number of individuals similar to itself, and however small the number of individuals different from itself, from which an isolated organism may arise, the time will arrive when the descendants that have varied will outnumber those that have not varied, providing the different generations breed in the same manner.

On the general theory of the influence of selection on correlation and variation, K. PEARSON (*Biometrika*, 8 (1912), No. 3-4, pp. 437-443).—This is a mathematical proof that certain formulas used by the author do not depend for their accuracy on the frequency being Gaussian in character.

"They are really peculiar to the general idea of the manifold near variate  $u$  which gives the maximum correlation coefficient of an  $(n+1)$ th variate with  $n$  other variates. They do not involve any idea of continuity or any hypothesis as to the nature of the selected means, standard deviations, and correlations beyond the fundamental assumption that the selected population really exists aside the unselected population."

The application of the correlation coefficient to Mendelian distributions, E. C. SNOW (*Biometrika*, 8 (1912), No. 3-4, pp. 420-424).—Several criticisms are made of methods previously noted (*E. S. R.*, 24, p. 374), and a demonstration of one is given to show that the method of finding correlation must be deter-

mined in each case according to the nature of the distributions dealt with, whereas some have applied all methods to all cases indiscriminately.

Supplementary tables for finding the correlation coefficient from tetrachoric groupings, P. F. EVERITT (*Biometrika*, 8 (1912), No. 4-1, pp. 385-395).—These tables were prepared to facilitate the determination of a correlation coefficient by the method of the fourfold table in those cases where correlation has a very high value.

### DAIRY FARMING—DAIRYING.

Dairying, K. STÖREN (*Meierilære. Christiania* [1911], pp. 282, figs. 118; rev. in *N. Y. Produce Rev. and Amer. Cream*, 32 (1911), No. 13, p. 482).—A general treatise on dairying.

New queen of the dairy world, O. ERF (*Hoard's Dairymen*, 43 (1912), No. 14, p. 543, figs. 3).—An account of methods of feeding and other data concerning the Holstein cow, Banostine Belle De Kol, which is reported to have produced 27,404.4 lbs. of milk in 1 year.

Milking with machines, F. SCHNEITER (*Wiener Landw. Ztg.*, 62 (1912), No. 27, pp. 339, 340, fig. 1).—A brief description of different types of milking machines, with a discussion of their practicability for the dairy farmer.

A short method of computing dairy rations according to the net energy standards, H. E. VAN NORMAN (*Pennsylvania Sta. Bul.* 114, pp. 3-20).—This bulletin presents a short method of computing dairy rations according to the net energy standards. The ordinary methods of computing balanced rations take into consideration their composition only, while with the energy standard the rations are computed according to their ability to do work as measured by energy after deducting the losses in feces, gas, urine, and energy of digestion. This leaves the net energy available for maintenance and milk production.

Samples of rations, a convenience table for compounding grain mixtures, and a table of energy values of the more common feeding stuffs are given.

On the specific effect of feeding stuffs upon milk production, A. MORROW (*Landw. Vers. Stat.*, 77 (1912), No. 1-2, pp. 17-31).—A brief report on an experiment with 3 sheep and 2 goats, with a review of previous work. All of these indicate that certain feeding stuffs exert a specific effect upon the yield of milk and the character of the milk fat.

The influence of organic and inorganic phosphorus compounds on milk secretion, G. FINGERLING (*Biochem. Ztschr.*, 59 (1912), No. 3-4, pp. 239-269).—Rations containing straw, blood albumin, molasses, peanut oil, starch, salt, and carbonate of lime were used in these experiments with 2 goats.

Neither organic nor inorganic phosphorus in the form of lecithin, phytin, casein, nuclein, nucleic acid, and disodium phosphates were found to have any specific effect upon the activity of the mammary glands as regards the amount of milk, percentage of milk constituents, or absolute percentage of lime or phosphorus content of the ash. The organic phosphorus produced no better results than the inorganic phosphorus, so that apparently animals can obtain their supply of phosphorus through inorganic as well as organic compounds.

Hypoplasia mammaria and the chemical composition of milk, U. SELAN (*R. Lab. Chim. Agr. Udine, Ric. Sper. e Attiv. Spiegata*, 3 (1909-10), pp. 33-38).—No appreciable difference was found in the chemical composition of milk in the diseased and normal quarters of 2 cows affected with congenital hypoplasia mammaria.

The effect of the presence of *Bacillus bulgaricus* and of *Bacterium lactis acidii* upon typhoid bacillus in milk, R. PORTER (*Rpt. Bd. Health Comm.*, 1909-10, pp. 150-154).—Samples of sterile milk were inoculated with bouillon

cultures of the typhoid germs, and at the same time with either a culture of *H. typhosus* or *B. lactis acidii*, which had been recently isolated from sour milk.

As a result of the work it is concluded that the repressing influence of both the ordinary lactic organism and the organism of Metchnikoff upon the growth of typhoid bacilli in milk, if it occurs at all, is so slight as to be of no significance, and these organisms can not be depended upon for rendering safe milk which has been inoculated with typhoid fever germs.

The selective action of media on organisms of the coli group, and its bearing on the question of variation in general, C. REVIS (*Centbl. Bakt. [etcl.]*, 8, Abt., 33 (1912), No. 17-19, pp. 407-428).—These experiments were made with milk in all cases except one. Ordinary milk was taken about 12 hours after milking and kept for 18 or 24 hours at a temperature of 20° C. and then examined, or else the milk was immediately examined and then kept for the necessary time and re-examined. One experiment was carried out with cow dung freshly excreted, and with a water dilution of it kept for 1 week at 20°. In all cases dilutions by tens were made down to 1:10°. One cc. of each after careful mixing was inoculated into tubes of bile salt glucose peptone water, and incubated for 18 to 24 hours at 37.5° anaerobically.

The results showed that the most numerous form is an organism coagulating milk and attacking lactose, saccharose, and adonitol vigorously. The other organism isolated on the same plate was evidently of the same variety, but much weaker in activity as the full fermentative power was not developed before 72 hours, whereas the other had exhibited its full effect in 24 hours. The results of the different forms are given, followed by a discussion of variation.

The following conclusions are drawn: "The types of coli-form organisms which appear on inoculation of dilutions of milk, etc., into bile salt glucose tubes are the result of a combination of mutual toxic action, acid development, and the nature of the medium. There is undoubted suppression of feeble organisms, particularly of those which can only produce acid and not gas from glucose.

"The aspect which at present obtains of the varieties of 'coli-form' organisms is an aspect determined by our media and its concomitants. Atypical forms of 'coli' are not degenerate forms, but stages in the variation of organisms belonging to the 'coli-typhoid' group."

A study of thirty-five strains of streptococci isolated from samples of milk, G. T. RUMDGER (*Amer. Jour. Pub. Health*, 2 (1912), No. 2, pp. 107-109).—The cultural and morphological characters of streptococci isolated from fresh milk are presented in tabular form, and the following conclusions are drawn:

"*Streptococcus lacticus* can be differentiated from *S. pyogenes* by means of blood agar plates. The latter produces small colonies surrounded by a large zone of hemolysis, whereas the former produces green or greenish colonies with little or no hemolysis. *S. lacticus* has no sanitary significance as it is found in nearly all samples of clean, soured and fresh milk, and very often in the healthy milk ducts. *S. pyogenes* seems to occur but rarely in milk and is indicative of the existence of an inflamed condition of the udder of the cow. It seems likely, however, that these organisms may persist for some time after the inflammation has subsided, and that they may occur in mild inflammatory conditions."

An epidemic of septic sore throat in Baltimore and its relation to a milk supply, L. P. HAMBURGER (*Jour. Amer. Med. Assoc.*, 58 (1912), No. 15, pp.



1109-1111).—A preliminary report of an outbreak of throat affection in which children were more frequently attacked and suffered more seriously than adults. The trouble was due to a streptococcus which contaminated the milk supply in a certain dairy during a brief period when a pasteurizer was disabled and unpasteurized milk was delivered.

Tests of the efficiency of pasteurization of milk under practical conditions. E. H. SCHÖBER and M. J. ROSENAT (*Jour. Med. Research*, 26 (1912), No. 1, pp. 127-153, fig. 1).—A study of the effectiveness of pasteurization by the holding process.

It was found difficult to regulate the temperature, and the milk was not heated uniformly until it had been running at least 7 minutes. There was more or less variation between the different layers of the milk, and it is also stated that the thermometer does not register the maximum or minimum temperature of parts of the milk that may pass.

Attempts were made to determine the efficiency of the apparatus in destroying pathogenic organisms, and the authors are confident that if milk reaches 140° F. and is held there for 20 minutes, tubercle, typhoid, and diphtheria bacilli will be killed, but a liberal factor for safety is required. Therefore, the best temperature to meet practical conditions is about 145°, and the milk should be held at this temperature for from 30 to 45 minutes. The single holding tank was not found as trustworthy as 2, 3, or 4 in series. The first tank acts as an equalizer, while the remaining tanks hold the milk at a uniform temperature. The necessity for official control of all pasteurizing plants is emphasized.

The pasteurization of milk. S. H. AYERS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ.* 184, pp. 44, figs. 32).—The information in this circular is compiled especially for dairy farmers and milk dealers. The topics discussed are the value of pasteurization, construction and arrangement of pasteurizing plants and machinery, care of machinery, controlling the process of pasteurization, handling and delivering pasteurized milk, and the cleaning of bottles and cans. The principal part of the work consists in the detailed description of different types of pasteurizers, holding tanks, retarders, and coolers. Comparative methods of the holding and flash process of pasteurizing are also discussed.

It is thought that pasteurizing in sealed bottles may become more popular in the future, the principal hindrance being the expensive equipment which is necessary, but it is believed that bottling milk while hot will make it possible to achieve practically the same results.

Some legal and practical aspects of a "bottled milk" regulation. J. O. JORDAN (*Amer. Jour. Pub. Health*, 2 (1912), No. 2, pp. 105, 106).—These are comments on the nullification by the supreme court of Massachusetts of the regulation of the Boston Board of Health, which prohibited the sale of milk or cream except in tightly closed or capped bottles or receptacles.

"This regulation went into effect on June 15, 1910, and had the endorsement of practically the entire community. Its enforcement had been carried on with such success that at the time of the above decision only 0.62 per cent of the daily supply was being sold in shops contrary to the provisions of the regulation. Furthermore, although the influence upon the public welfare from this change of handling can not be directly demonstrated, the facts obtainable indicate a decided improvement in the quality of shop milk from both chemical and bacteriological standpoints. Thus there were 27.8 per cent less court prosecutions based on low standard shop milk (i. e., deficiency in milk solids or fat) from June 15, 1910, to February 1, 1911, than for the corresponding period in 1909-10. Bacteriologically the gain is more remarkable, for despite the fact

that the regulation did not become operative until June 15, 1910, 77.8 per cent of the shop milk for the year 1910-11 complied with the board's regulation of 500,000 bacteria per cubic centimeter, while for the year 1909-10 only 54.74 per cent of the milk from stores conformed to this standard."

The permit system of cream buying, D. S. BUNCH and W. F. DROGE (*Kansas Sta. Bul.*, 187, pp. 397-440, figs. 34).—This bulletin, which has been prepared for persons engaged in receiving, sampling, and testing cream, gives a list of a cream-station equipment, methods of receiving and sampling cream, instructions for testing and paying for cream, milk, and skim milk, a discussion of cream-station difficulties, bacteria affecting milk and cream, and related problems.

The temperature of pasteurization for butter making, L. A. ROGERS, W. N. BERRY, and B. J. DAVIS (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 307-326, figs. 3; Circ. 189, pp. 307-326, figs. 3*).—The object of this investigation was to determine the proper temperature for pasteurization of cream for butter making as indicated by the destruction of bacteria and enzymes, and changes in flavor of the butter during storage. The pasteurizing was done in a continuous Jensen machine. The cream was cooled at once to churning temperature and churned within 3 hours.

From the results, presented in tabular form, it would seem that cream of a good quality can be efficiently pasteurized from the bacteriological standpoint by momentary heating to 71° C., but this is near the lower limit of safety, and if the bacterial content of the raw cream is high a temperature of from 74 to 77° C. must be used to secure uniform results. Peroxidase was destroyed at 77° and catalase and lipase at 70°. Galactase was much weakened by temperatures between 71 and 77°, but was not destroyed at 93°, the highest temperature employed.

An examination of the butter after storage indicated that pasteurizing at 66° or lower left in the cream some factor causing a deterioration of the butter which did not occur at 71° or higher. At 82° there was a cooked or scorched flavor to the butter, but this effect may be controlled to some extent by the skill of the butter maker. For the continuous pasteurization of sweet cream for butter making, therefore, a temperature of not lower than 74°, nor higher than 80°, is recommended, but it is stated that this applies to the pasteurizing of sweet cream in a continuous machine only. If cream is pasteurized in a vat or other holding device lower temperatures can probably be used.

Better butter for Kansas (*Kansas Sta. Circ. 21, pp. 4, figs. 2*).—This circular is written to show why cream is often of poor quality owing to bad management, and that good prices can be paid only for cream of superior quality.

Italian cheese-marking regulations, L. J. KEENA (*Daily Cons. and Trade Rpts. U. S.*, 15 (1912), No. 82, p. 93).—This consists of extracts from the new Italian law relative to marking adulterated cheeses.

Increasing creamery profits by handling special products and utilizing by-products, S. C. THOMPSON (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 297-306, Circ. 188, pp. 297-306*).—This article contains practical suggestions to creamery operators for increasing their profits. The following topics are treated: The sale of sweet cream, manufacture of ice cream and casein, feeding of buttermilk to hogs, and handling eggs through the creamery.

The necessity for controlling the bacterial content of pharmaceutical lactic ferments, A. BERTHELOT and D. M. BERTRAND (*Ann. Patisf.*, 5 (1912), No. 42, pp. 164-171).—Analyses of samples of commercial lactic ferments revealed the presence of undesirable types of bacteria, and it is urged that government control is necessary.

## VETERINARY MEDICINE.

Book of veterinary doses, therapeutic terms, and prescription writing. P. A. FISH (Ithaca, N. Y., 1912, 4. ed., rev. and enl., pp. 185).—A fourth revised and enlarged edition of this pocket guide.

On the distribution of arsenic in the animal organism, SCHMIDT and NAUMANN (Arch. Schiffs u. Tropen Hyg., 16 (1912), No. 4, pp. 101-109).—In the *Sleeping Sickness Bur.* [London] *Bul.*, 4 (1912), No. 55, pp. 105, 106).—In the investigations here reported arsenophenyglycin was administered to normal rabbits and to rabbits infected for a longer or shorter time with nagana. Each animal received a given dose and after a period of 24 or 48 hours was killed. The conclusions drawn are as follows:

"Twenty-four hours after intravenous injection the greater part of the arsenic is circulating in the blood. An infected rabbit excreted less arsenic than a non-infected rabbit. The blood serum contains considerably more arsenic than the blood clot. It is to be assumed that the blood cells of the circulating blood do not withdraw from the plasma any appreciable quantity of arsenic.

"The arsenic content of the organs varies apparently in an irregular manner. Absolutely, as well as relatively, the quantity of arsenic found is least in the brain and spinal marrow. Of the abdominal organs the kidneys contain relatively the most and the liver the smallest quantity of arsenic (5 out of 6 cases).

"If one takes into account the blood contained in the organs, by subtracting the arsenic contents of this from the arsenic found in the organs one gets the following results: The splenic cells always contain relatively large quantities of arsenic. Then follow the kidney cells. The arsenic content of the liver cells fluctuates within wide limits; it is always under that of the spleen and kidneys. The cells of the brain and spinal cord are free from arsenic."

Stock poisoning by larkspur, C. D. MARSH (Proc. Amer. Nat. Live Stock Assoc., 15 (1911), pp. 69-77).—In the author's investigations it was found that cattle were never poisoned when they ate less than 30 lbs. of larkspur per 1,000 lbs. weight of the animal. An equal quantity of either the tall or low larkspur was required to produce the toxic effect. Cattle on the range were rarely poisoned by tall larkspur after the first week in July, whereas the low larkspur was poisonous from the time it starts in the spring until the flowers drop from it the first of July, it being a little more poisonous about July 1 than at any other time, due to the fact that the seeds are somewhat more poisonous than the other parts of the plant above ground. In experiments with horses it was found possible to get them to feed on larkspur, although on the open ranges they never eat it in any large quantity. It is stated that sheep feed on larkspur very readily and actually grow fat upon it, without the slightest harm.

It was found with experimental animals that where remedies were not applied about half of the affected animals recovered. It is stated that a remedy which results in the recovery of about 96 per cent of the affected animals has been found, a description of which will be published in a forthcoming report.

The regional lymph glands of food-producing animals, J. S. BUCKLEY and T. CASTOR (U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 371-400, pls. 3, figs. 12; Circ. 192, pp. 371-400, pls. 3, figs. 12).—This paper deals with the topographical anatomy of the lymphatic apparatus of food-producing animals.

"It is regrettable that a more absolute knowledge does not exist of the anatomical detail of this system in the various food animals; but an endeavor has been made to supply as much as possible of the general knowledge that could be gleaned from the various works that treat of this subject, together with a fair amount of original investigation carried out by the writers of this paper."

The bactericidal substances of leucocytes.—Their mode of action, W. S. R. (*Genet. Bakt. [etc.]*, 1. Abt., Orig., 59 (1911), No. 2, pp. 178-182).—As a result of this work it is pointed out that the bactericidal property of leucocytes is not a complex process such as occurs with sera. If leucocyte extracts are heated to inactivity and a portion of unheated extract is added no reactivation takes place.

Filterable virus, G. VALLILLO (*Ztschr. Infektionskrank. u. Hyg. Haustiere*, 9 (1911), No. 5, pp. 433-479).—This is a critical review of the literature pertaining to the diseases caused by, or at various times supposed to be caused by, filterable viruses. It embraces both the fields of veterinary and human medicine, and also contains a discussion of the mosaic disease of tobacco.

Pathogenic bacteriology, C. E. MARSHALL (*Michigan Sta. Rpt. 1911*, pp. 155-170).—This is a brief account of the occurrence and work of the year with contagious abortion, infectious anemia in horses at Watersmeet, a disease of cattle near Uby, Huron County, malignant catarrh of cattle, granular vaginitis of cattle, avian tuberculosis, a disease of sheep in Clinton County, and worms in pigs. The tuberculin test proved inapplicable for chickens.

Annual report of the official veterinarians of Prussia for 1909, NEVERMANN (*Veröffentl. Jahres-Vet. Ber. Tierärzte Preuss.*, 10 (1909 [pub. 1911]), pt. 1, pp. VI+152, pls. 17; 10 (1909 [pub. 1912]), pt. 2, pp. IV+169).—The first part of this report consists of statistical data, discussions, etc., on anthrax, symptomatic anthrax, rabies, glanders, inflammation of the brain and spinal cord in horses, foot-and-mouth disease, lung plague, dourine, vesicular eruption in horses and bovines, scabies in horses and sheep, swine erysipelas, swine plague, hog cholera, chicken cholera, fowl plague, equine influenza, and strangles in the horse.

The second part deals with diseases that the law does not require to be officially reported, poisoning, general disturbances of nutrition, sporadic diseases, meat inspection, statistics relating to farm animals, etc.

Epizootics in the German Empire (*Jahresber. Verbr. Tierseuch. Deut. Reich*, 25 (1910), pp. VII+200, pls. 4, figs. 20).—This is a report in regard to the distribution of epizootics in the German Empire during the year 1910.

Combating dysentery in calves, shoats, lambs, and foals, the gastric form of canine distemper, and other infectious stomachical and intestinal diseases with Ventrase, M. KLIMMER (*Deut. Landw. Presse*, 39 (1912), No. 1, pp. 1, 2; *Berlin. Tierärztl. Wchnschr.*, 28 (1912), No. 1, pp. 1-7).—Ventrase, which is a colloidal silver preparation containing in addition a protective colloid, is given to new-born calves and other animals with the milk. Comparing the results thus obtained with check animals which received no Ventrase, the results are considered good. In one of the articles the germicidal value of this preparation for the intestinal tract of dogs was also studied.

The protozoan parasites of domesticated animals, H. CRAWLEY (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 465-498, pls. 6, figs. 13; *Circ.* 194, pp. 465-498, pls. 6, figs. 13).—This is a popular account of the more common protozoan parasites of domesticated animals, including spirochetes, trypanosomes, coccidia, piroplasms, sarcocysts, etc.

Fasciolopsis buski in Tonkin.—Its extreme rarity in man; its frequency in the hog, C. MARSH and M. LEECH (*Bul. Soc. Path. Exot.*, 4 (1911), No. 4, pp. 290-292; *also in Jour. Trop. Vet. Sci.*, 7 (1912), No. 1, pp. 149, 150).—Of 248 heads of swine examined at the abattoir at Hanoi, December 9-27, 1910, 16 harbored this fluke. As many as 20 were found in one animal.

Our present knowledge of the distribution and importance of some parasitic diseases of sheep and cattle in the United States, M. C. HALL (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 419-463, pls. 2, figs. 18; *Circ.* 193,

pp. 419-463, pls. 2, figs. 18).—Following a brief discussion of the importance of parasitic diseases and the desirability of a study of distribution, etc., the author takes up the present knowledge of the distribution and importance of *Parascaris bigeminum*, *Fasciola hepatica*, *F. magna*, *Multiceps multiplex*, *Thysanotoma actinoides*, *Haemonchus contortus*, *Oesophagostomum columbianum*, *Oestrus ovis*, and *Psoroptes communis ovis*, respectively.

Maps illustrating the distribution of these parasites and a bibliography of 33 titles are included.

Cysticerci in American sheep, reindeer, and cattle, B. H. RANSOM (*Science*, n. ser., 35 (1912), No. 903, p. 636).—It is stated that the heart and voluntary muscles of sheep are frequently found by federal meat inspectors to be infested with cysticerci. While these cysticerci closely resemble *Cysticercus cellulosa*, it is improbable that so many cases of this parasite would occur in sheep and be so comparatively rare in this country in hogs, which are the usual host.

Specimens of muscle cysticerci from Alaskan reindeer have been provisionally identified as the cysticerci of *Tania krabbei*, a tapeworm of the dog. Mention is made of some unusually high percentages of infestation of cattle with *C. bovis*.

The determination of opsonins and bacterial tropins in antistreptococcal serum in horses, PRICOLI and BARTELLI (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig.*, 34 (1911), Nos. 17, pp. 769-775; 18-19, pp. 817-826; obs. in *Berlin. Tierärztl. Wechnschr.*, 28 (1912), No. 7, p. 127).—Normal and immune sera were both found to contain substances capable of stimulating the phagocytosis of *Streptococcus equi*. In normal serum the substances are thermolabile, while in immune they are thermostable. They are present in larger amounts in the immune sera.

The opsonic index was found to fluctuate only between very narrow limits. It was greater in immune animals, but on injection of virulent organisms it was found to assume a negative phase. Accordingly, it is concluded that opsonins and bacterial tropins are different substances.

In regard to the preparation of a precipitating anthrax serum, W. N. MARKOFF (*Berlin. Tierärztl. Wechnschr.*, 27 (1911), No. 47, pp. 849-851).—By injecting rabbits with bacteria-free extracts of the anthrax bacillus it is possible to obtain a specific precipitating serum. The specific precipitating substances in the serum rise to a certain fastigium and then begin to vanish gradually. Physiological salt solution (0.85 per cent) is not recommended for preparing the antigen, as it produces a ring in the test with the specific serum itself. Bouillon can be used to better advantage.

Treatment of anthrax by hypodermic injections of carbolic acid, G. CONDER (*Jour. Trop. Vet. Sci.*, 6 (1911), No. 4, pp. 436-441).—In this article are recorded the results of treating 11 horses affected with anthrax by injections of carbolic acid. These were given every 2 to 4 hours at the beginning of the disease, and later every 6 hours until the temperature reached normal.

Seven of the cases recovered, and of the 4 animals which died 3 did not receive the treatment in the early stages of the disease. Two other animals which received no treatment died.

The significance of agglutination for diagnosing blackleg and the fermenting capacity of the *Bacillus anthracis* symtomatiel, with particular regard to differentiating between symptomatic anthrax and malignant edema, G. GROSSO (*Berlin. Tierärztl. Wechnschr.*, 27 (1911), No. 35, pp. 621-625).—The results show that the highest fermenting capacity toward dextrose, lactose, saccharose, and glycerin was possessed by the *B. anthracis symtomatiel*. The pseudo blackleg bacteria also fermented saccharose but not glycerin. The bacillus of malignant edema in a few instances decomposed glycerin,

but did not ferment saccharose. The *B. anthracis symptomatici* can be sharply distinguished from the edema bacillus on the basis of the fermentation test.

Various methods for the diagnosis of glanders, J. R. MOHLER and A. SCHNEIDER (U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 345-370, pls. 4; Circ. 191, pp. 345-370, pls. 4).—After discussing the nature of glanders, particularly occult glanders, the authors give a description of practically all the tests thus far proposed for its diagnosis. The tests considered are physical examination, post-mortem examination, the auto-inoculation method, extirpation of the submaxillary gland, mallein reaction (subcutaneous), the ophthalmic test, cutaneous tests, the agglutination reaction, precipitation reaction, complement fixation test, and the combined complement fixation and agglutination tests. In all instances the methods of conducting the tests, the interpretation of the reactions, and their reliability are considered.

On the sero-diagnosis of glanders, K. F. MEYER (Rpt. Govt. Vet. Bact. Transact., 1909-10, pp. 156-169).—Substantially noted previously (E. S. R., 25, p. 684).

The action of "606" upon glanders in laboratory animals, W. BENEWOLENSKY (Abs. in Vet. Rec., 24 (1911), No. 1201, p. 39).—Rabbits, guinea pigs, and cats were artificially infected with glanders by means of a 3 days' culture of bacilli in glycerin agar, and were afterwards treated with one or two injections of Salvarsan ("606"). The glanders bacilli were introduced intraperitoneally in the case of 11 guinea pigs and 15 rabbits, and into the back of the neck in 12 cats, with 6 rabbits, 4 cats, and 4 guinea pigs as controls. In animals that died, in addition to post-mortem observation, cultural experiments were made with the heart's blood and from the liver and spleen. The author also tested the action of Salvarsan upon glanders bacilli in vitro.

The results showed a very clearly evident influence of Salvarsan upon the glandular processes. The duration of the diseased process stood in definite relationship to the quantity of Salvarsan injected, especially in the case of rabbits. Animals which received a quantity of Salvarsan approaching the dose tolerated by the species died quickly, while those which received no Salvarsan died in due course from the ordinary progression of the disease. Animals which had received a smaller dose of Salvarsan, on the other hand, lived. In acute glandular processes it is possible to sterilize the infected organs by means of Salvarsan.

The treatment of tetanus, G. BACCELLI (Berlin. Klin. Wchnschr., 48 (1911), No. 23, pp. 1021-1024; abs. in Berlin Tierärztl. Wchnschr., 27 (1911), No. 35, p. 627).—In galloping cases of tetanus heroic doses of antitetanin are without value, as they bring about a peracute condition.

Influence of tetanus toxin and tuberculin upon autolysis.—Behavior of the lipoids, G. PRISCY (Centbl. Bakt. [etc.], 1. Abt., Orig., 59 (1911), No. 2, pp. 186-188).—The author sought to determine how the lipoids of autolysates of organs (sheep's liver taken after death) behave when brought into contact with tetanus toxin and tuberculin, with particular reference to the autolytic process. Controls were prepared of the autolysates containing no additions.

From the results it could be noted that a diminution in neutral fats and fatty acids and an increase in soaps took place in the case of the tetanus toxin, while in the tuberculin no appreciable changes could be observed.

The passage of tubercle bacilli through the intact skin, H. KOENIGSFELD (Centbl. Bakt. [etc.], 1. Abt., Orig., 60 (1911), No. 1-2, pp. 28-68, figs. 3).—The results indicate that tubercle bacilli pass through the skin via the hair follicles from which the hair has been cut or shaved off or removed with a depilator. No difference seems to exist between the infection caused by either

the human or bovine type of bacillus. The skin in no instance showed any visible microscopic changes, and seems to be greatly resistant to the infection.

Tubercular septum in the nose of a bovine, P. CHAUSSE (Rev. Méd. Vét., 88 (1911), No. 24, pp. 580-585, figs. 3).—The results are given of a histopathological study of a case in which the nasal septum of an 8-year-old cow was affected. The animal had a generalized tuberculosis.

Improved technique for diagnostic inoculation of animals with tuberculous material, R. OFFENHEIMER (München. Med. Wchnschr., 58 (1911), No. 41, pp. 2164-2166; abs. in Jour. Amer. Med. Assoc., 57 (1911), No. 21, p. 1781).—The urine of the suspect was injected directly into the liver of guinea pigs. Specific lesions were found to develop in about 16 days.

The subcutaneous bovotuberculin test for the diagnosis of bovine tuberculosis, H. BAUSCH (Die Subkutane Bovotuberkulinprobe für die Diagnose der Rindertuberkulose. Inaug. Diss., Univ. Bern, 9111, pp. 27; abs. in Ztschr. Tuberkulose, 18 (1912), No. 5, p. 509).—As a result of examining 302 animals in an abattoir at Darmstadt, Germany, the author finds that the tuberculin test when used subcutaneously yields better results than those obtained with tuberculin. A previous eye test will have no influence upon a subsequent tuberculin reaction, but it must be conducted after the subcutaneous injection.

The vaccination of cattle against tuberculosis, E. C. SCHWOBES ET AL. (U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910, pp. 327-343; Circ. 190, pp. 327-343).—Previously noted from another source (E. S. R., 25, p. 288).

The medicament treatment of piroplasmosis, E. MEULEMAN (Rev. Gén. Méd. Vét., 19 (1912), No. 223, pp. 365-380).—This is a review of recent work.

Vaccination against bovine piroplasmosis, J. LIGNIÈRES (Rev. Gén. Méd. Vét., 18 (1911), No. 213, pp. 489-506; abs. in Jour. Compar. Path. and Ther., 25 (1912), No. 1, pp. 59-63).—The author claims to have shown that animals which are very resistant to *Piroplasma bigeminum* may be very susceptible to a new piroplasm which he has named *P. argentinum* and that the latter may even prove fatal.

Blood taken from diseased cattle at a time when it contained a maximum number of parasites and kept at from 5° to 8° C. for 30 days, when injected intravenously, frequently caused a mild form of the disease, which was followed by immunity. The parasites present in this blood were found to be smaller than normal, spherical, and apparently multiplying. An intravenous injection of 10 cc. of this blood caused about the seventh day a general reaction which lasted for 1 or 2 days. This first vaccine retained its vitality for at least 8 days.

The methods of preparing the vaccine from blood containing the *P. bigeminum* by desiccation or freezing can not be applied to the *P. argentinum*, because this parasite retains both vitality and virulence after freezing. Since the introduction of the method 23,000 animals have been vaccinated.

Some results of cattle-tick eradication (U. S. Dept. Agr., Bur. Anim. Indus. Circ. 196, pp. 4).—This is a summary of the replies received in response to a series of questions sent out in an effort to secure direct evidence from cattle-men and farmers regarding the benefits to the cattle industry of the South which are being derived from the tick-eradication work carried on in cooperation between the Bureau of Animal Industry of this Department and the various States within the quarantined area.

The etiology of pleuro-pneumonia, E. J. MARTZINOVSKI (Ann. Inst. Pasteur, 25 (1911), No. 12, pp. 914-917, pl. 1).—The author here reports studies commenced in 1909 which have led him to conclude that pleuro-pneumonia is caused by a minute gram-negative, polymorphous, nonmotile bacterium, to which he gives the name *Coccobacillus mycoides peripneumoniae*. A magnification of 1,000 diameters is necessary in order to distinguish it clearly.

parturient paresis (milk fever) and eclampsia; and the internal secretion of the mammae as a factor in the onset of labor (*Kentucky Sta. Bul.* 160, pp. 89-101, pts. 3; *Jour. Infect. Diseases*, 10 (1912), No. 2, pp. 226-232, 233-243, 244-247, pp. 12).—This bulletin consists of 3 papers.

*Parturient paresis (milk fever), and eclampsia; similarities between these two diseases.* D. J. Healy and J. H. Kastle (pp. 83-90).—In this first paper the symptoms of parturient paresis and eclampsia are discussed and the similarities between the 2 diseases pointed out. A normal clinical urinalysis, based upon 100 urinalyses of the dairy cow covering a period of 3 winter and 3 summer months, is described, together with the urinalyses of 3 cases of parturient paresis. Since none of the 3 cases observed during the year succumbed, the finer pathological changes occurring in parturient paresis have not been established.

The theories of the cause of the 2 diseases are next discussed. "That the disease is due to a toxin elaborated in the udder, as the result of its own metabolism preceding normal milk production, there can be no reasonable doubt, and that the success of the modern treatment is due to preventing, by means of pressure, the absorption of this toxin seems most highly probable.

"We are of the opinion that eclampsia is due to a similar toxin elaborated by the breast in a similar manner, and would strongly recommend, as the most promising treatment, dilatation of the breasts with oxygen or sterile air, accompanied by vigorous massage of the breasts, or forcible compression of them by means of a properly applied bandage, at the same time using whatever medical measures may be indicated."

*The toxic character of the colostrum in parturient paresis.* J. H. Kastle and D. J. Healy (pp. 91-100).—In this second paper the authors report tests made of the effect upon the guinea pig of injections of the first colostrum of cows suffering from parturient paresis, the first colostrum of the normal cow, fresh milk from the station herd, the urine of the normal cow and the first urine of a cow suffering from parturient paresis, normal salt solution (0.85 per cent NaCl), and the aqueous solution of certain residues from colostrum and milk left after precipitating the colostrum and milk with dilute acid, and evaporating, respectively.

"It is evident from these results that normal salt solution, fresh milk from normal cows, the colostrum of normal cows, and the urine of a healthy cow cause no serious disturbances in the normal guinea pig, when injected into the peritoneal cavity. The injection of the colostrum of normal cows invariably caused a diarrhea in healthy guinea pigs, male and female, from which they gradually recovered after a few days. . . .

"On the other hand, death resulted from the injection of the colostrum of the cow having parturient paresis, and the post-mortem and microscopical examinations of the organs of the 4 guinea pigs that were thus killed showed the same pathological degenerations and changes that are characteristic of eclampsia. Unfortunately, but little if anything seems to be known regarding the micro-pathology of parturient paresis in the cow. We have shown, however, that cows recovering from an attack of this disease invariably show a nephritis. Our results with the colostrum of the cow suffering with parturient paresis certainly go to show the presence therein of some substance toxic to guinea pigs and certainly point to the udder and the mammary glands as the place of origin of the toxins or internal secretions producing parturient paresis and eclampsia respectively. The fact that the urine of the cow with parturient paresis causes such a profound diuresis in the guinea pig also points to the presence of toxic substances in the urine of animals so affected, and indicates that these toxins are not entirely destroyed in the tissues of the cow, but are in part at least, and



it may be in somewhat modified form, excreted by the kidneys. The fact also that the colostrum of the cow during an attack of parturient paresis invariably caused an abortion in pregnant guinea pigs is a matter of considerable physiological significance and will be discussed more fully in the following paper."

*The internal secretion of the mamma as a factor in the onset of labor*, D. J. Healy and J. H. Kastle (pp. 101-104).—In this third paper the authors report experiments in which they found that the colostrum of the normal cow, as well as of the cow suffering from parturient paresis, contains a substance or substances, capable of bringing about abortion in pregnant guinea pigs. "The substance or substances in the fresh colostrum of the normal cow which excite the pregnant guinea pig to premature labor, withstands heating to boiling for a short time. In this respect it is similar to the hormones and differs from the soluble ferments and many toxins."

An unusual cause of udder disease, L. A. KLEIN (*Amer. Vet. Rev.*, 41 (1912), No. 1, pp. 30-37).—The author describes an affection in which the skin of the udder, especially about the base of the teats, was irritated, dry, stiff, scaly, and sometimes swollen or thickened, while the milk of affected animals contained small flakes and white jelly-like clumps. At the time the cows were first examined only a few animals were affected but the number gradually included 90 per cent of the cows of a large dairy herd, clumps and flakes being so numerous that the cotton strainer was clogged and the milk would not pass through. In many instances small scabs were present, indicating the previous existence of a crack or fissure, and in some cases small abrasions or excoriations were present. The condition resembled in all respects a mild acute or subacute inflammation of the skin. Of the 48 cows showing the milk changes or teat symptoms, indicating the presence of catarrhal mastitis, 30 also exhibited these alterations in the skin covering the base of the teat."

The author's investigations showed the disease to be due to the exposure of the wet udder to cold, it having been the practice to wash the croup, buttocks, flanks, the legs (inside and out, down to the claws), the tail, and the udder with a mild disinfectant solution. "The udder trouble began about the middle of November, just after cold weather had begun. There were more affected cows in the end of the stable where the doors were frequently opened and kept partly opened for ventilation than in the other end where they were almost constantly closed. The irritated condition of the skin, observed on the udders was just at the point where fluids placed on a clipped udder would collect by gravitation, and which, therefore, would remain wet longest."

The application of excessive quantities of water in cleaning the cows was replaced by dry brushing, using water only when necessary, wiping the udder with a cloth dampened with a 2 per cent solution of sodium carbonate, and then anointing with a small amount of vaseline. This, together with the administration of 3 drams of bicarbonate of soda and 1½ drams each of sodium sulphate and potassium acetate upon the feed twice daily, resulted in the recovery of the animals.

Primary splenomegaly in sheep, L. E. DAY (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 415-418).—Splenomegaly as a distinct pathological process was first described in 1882, but so far as the author has been able to determine, has not been reported in the lower animals. An examination, both macroscopic and microscopic, made of an enlarged spleen and the liver from a sheep, which were received for diagnosis from one of the large slaughtering establishments in Chicago, is here reported in detail. The changes in the tissue were so characteristic that a diagnosis was made of primary splenomegaly.

The preparation of hog cholera serum in Hungary, A. EICHNER (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 401-413, pls. 2, figs. 6).—This is a

description of the apparatus and methods for preparing hog cholera serum in use at the government laboratory at Kobánya, a suburb of Budapest, Hungary. The process followed is essentially that devised by this Department, with certain modifications in details and apparatus. The table on which hogs are placed for bleeding, apparatus used in bleeding hogs, stall for securing hogs for inoculation with virus, stand for securing hogs for bleeding from the tail, apparatus for siphoning serum after centrifugalization of blood, and apparatus for filling the bottles with serum are described. The directions for the use of the serum are given, and the results obtained in its use, the selection of hogs for the production of serum, experiments with the simultaneous method of inoculation, the disposal of meat of hogs used in serum production, and price of serum, etc., are briefly discussed.

Some observations on the clinical symptoms, prophylaxis, and treatment of distemper, J. P. McGOWAN (*Vet. Jour.*, 68 (1912), No. 439, pp. 7-17).—The author again describes an organism (E. S. R., 24, p. 787) which is "a gram-negative bacillus, and which shows, when stained by carbol thionin, polar staining or a constriction in the middle. Its length varies from 2.3  $\mu$  to 0.5  $\mu$ , and its breadth from 0.5  $\mu$  to 0.4  $\mu$ ." Its size is particularly variable "when grown in glycerin agar, assuming an almost coccal form." It is only slightly motile, has flagella, and forms no spores. The growth on the surface of agar is very characteristic, showing at the end of 24 hours hardly visible dewdrops, which enlarge very rapidly during the next 24 hours and assume the size of pin-heads which are raised above the surface of the medium and have a porcellaneous appearance with some opalescence. The growth is more rapid on blood agar. The organism renders litmus milk alkaline and produces no gas in saccharine substances and related bodies. As regards pathogenicity, it produces "typical distemper with the rise of temperature with the nasal discharge, eye symptoms, and later 'chorea' and distemper rash. It was produced in one puppy by pouring a culture of the organism down its nose; in another pup a much milder form of the disease was produced." It was only lethal for mice.

The author divides distemper as follows: "(1) Uncomplicated distemper; (2) complicated distemper, [with] subgroups, viz, (a) complications due to spread of infection by the distemper organism to various parts, (b) complications due to added infections by organisms other than the distemper organism, (c) complications due to toxins, (d) complications due to causes other than above; (3) mixtures of the above groups."

These forms are discussed, together with the prophylactic and curative treatment of the disease.

Further studies on the *Bacillus bronchicanis*, the cause of canine distemper, N. S. FERRY (*Amer. Vet. Rev.*, 41 (1912), No. 1, pp. 77-79).—Since the publication of the article previously noted (E. S. R., 24, p. 285), it has been found that the disease due to *B. bronchicanis* may be more widespread among animals than has been thought to be the case. In studies made during the course of an outbreak among laboratory animals, it was found that although the symptoms differ somewhat in various animals, yet the primary cause without a single exception was due to this organism.

"In nearly 100 per cent of the cases the *B. bronchicanis* was found at autopsy in pure culture in the lower trachea. In but a very few of the cases was there any sign of a nasal discharge or any abnormal condition of the eyes. The majority of the rabbits showed symptoms of distemper, commonly called, in the rabbit, 'snuffles,' while but 2 or 3 of the guinea pigs were thus affected, and

none of the monkeys. Only one of the animals, a monkey, had shown signs of a cough, which animals gave the *B. bronchicanis* pure in the trachea and blood."

Since the organism attacks other animals besides the dog, the author proposes to change the name to *Bacillus bronchisepticus*.

Contribution to the study of epizootic lymphangitis, M. L. TEPPAZ (*Jour. Trop. Vet. Sci.*, 7 (1912), No. 1, pp. 53-61).—*Leucocytozoon piroplasmoides* was found in the pus of all the buds of 100 horses that were examined, to the exclusion of all other organisms.

An anatomo-pathological and experimental study of pernicious anemia (typho-anémie infectieuse) of the horse, G. FINZI (*Rev. Gén. Méd. Vét.*, 18 (1911), No. 216, pp. 681-687, figs. 2).—The author reports studies made of the lesions found in the liver, kidneys, and spleen, together with studies of the blood.

A contribution to the study of infectious paraplegia of the horse, A. MOULUN and A. M. OYUELA (*Bul. Soc. Cent. Méd. Vét.*, 89 (1912), No. 6, pp. 140-145).—This paper consists of clinical and bacteriological notes made during an epidemic at Maizières, France, in November, 1911.

A report upon the permanent value of the roaring operation as evidenced by the present condition of 100 horses which have been satisfactorily operated upon for roaring from 18 months to 2½ years ago, F. HORDAY (*Vet. Jour.*, 68 (1912), No. 442, pp. 207-218).—The author, who has operated for roaring upon more than 520 individual horses, finds that the beneficial results obtained are lasting.

## RURAL ENGINEERING.

On the measurement and division of water, L. G. CARPENTER (*Colorado Sta. Bul.* 150, pp. 3-48, figs. 5).—This is a revision of Bulletin 27 of the station, previously noted (*E. S. R.*, 6, p. 485), to which is added a set of tables showing the discharge over right-angled triangular weir notches, and a discussion of the use of rating flumes and of Kutter's formula for determining the flow in canals.

[Investigation of the regulation of hydraulic works in the United States of America], R. TAVERNIER (*Ann. Dir. Hydraul. et Amélior. Agr., Min. Agr. [France]*, 1909, No. 39, pp. 307-447).—This report deals with the developments in the United States relative to laws regulating interior navigation, irrigation, water power, and the conservation of these natural resources. In connection with this report are a number of reports and articles on irrigation, hydraulics, hydroelectric works, and reclamation in various parts of the United States.

An experiment station for irrigation, M. CONTI (*Agr. Colon. [Italy]*, 6 (1912), No. 1-2, pp. 29-37, figs. 6).—This article deals with the need and importance of irrigation in Argentina, briefly discusses institutions for experimental agricultural hydraulics, and describes the irrigation experiment station conducted by the Faculty of Agronomy of the National School of Agriculture at Buenos Aires and its work.

Irrigation in Egypt, J. BAROIS (*Les Irrigations en Egypte. Paris, 1911, 2. ed., rev. and enl., pp. XVI+422, pls. 17, figs. 90*).—This publication deals with irrigation works and irrigation administration and legislation in Egypt, and discusses the topography and character of the soil, inundation, irrigation of the Delta and of middle Egypt, drainage of irrigated land, and construction and maintenance of dams and canals. A description is given of the inundation basins, of different irrigation works, and of agricultural developments in Egypt.

Irrigation and drainage, L. A. B. WADE (*Rpt. Dept. Pub. Works N. S. Wales, 1911, pp. 33-67*).—This report covers the operations and expenditures

of the irrigation and drainage branch of the department of public works of New South Wales in 1911, embodying the reports of the assistant engineers on sewerage construction, swamp drainage and water conservation, irrigation, artesian boring, and river discharge observations and records.

Proceedings of third annual drainage convention held at Wilmington, N. C., November 22, 23, 1910, J. H. PRATT (*N. C. Geol. and Econ. Survey, Econ. Paper 21, 1911, pp. 67, pls. 4*).—This paper gives the proceedings of the third annual drainage convention held in North Carolina in 1910, a copy of the North Carolina drainage law, North Carolina supreme court decisions regarding the validity of drainage bonds, and a paper on Tile Drainage by J. R. Haswell, of the Drainage Investigations of this Office.

Reclaiming land by drainage, H. R. McVEIGH (*Manfrs. Rec., 61 (1912), No. 15, pp. 51-53, figs. 3*).—This article deals with the development of levee and drainage districts in the lower Mississippi Valley, and discusses several drainage projects in this locality intended to drain and make fit for cultivation some 2,300,000 acres of land.

[Drainage in land reclamation] (*Manfrs. Rec., 61 (1912), No. 11, pp. 49, 50, figs. 4*).—A drainage development work in Florida by which it is intended to reclaim a tract of 118,000 acres of land is described.

[A drainage plan in Louisiana], W. S. WHITE (*Rice Jour. and South. Farmer, 15 (1912), No. 5, p. 3, fig. 1*).—A description is given of a plan for draining an area of 41,000 acres of land in Louisiana. This work involves about 18 miles of ditch, requiring about 653,400 cu. yds. of excavation. Specifications for clearing and excavating are given.

Drainage, E. J. WATSON (*Ann. Rpt. Comr. Agr., Com. and Indus. S. C., 8 (1911), pp. 101-111, fig. 1*).—This report deals with the South Carolina drainage act, surveys and preliminary examinations of drainage projects in the State, the organization of the National Drainage Congress, and the South Carolina State Drainage Association, and the growth of irrigation developments in the State.

Cost and methods of clearing land in western Washington, H. THOMPSON (*U. S. Dept. Agr., Bur. Plant Indus. Bul. 239, pp. 60, figs. 25*).—This bulletin represents cooperative studies with the Washington, Wisconsin, and Minnesota stations, and a portion of the work reported has been previously noted (*E. S. R., 26, p. 787*). It calls attention to the extent of waste stump land in western Washington and deals with the methods and costs of clearing this land for farming purposes and for general use, briefly discussing the methods for converting stump land into pasture and describing and discussing the methods and apparatus required for removing stumps by heavy blasting, by a stump puller with and without blasting, by a donkey engine, and by char-pitting and burning. Cost data are given for removing stumps of varying sizes under varying conditions by each of the above methods.

It is concluded that a man without capital can not hope to clear, in a short time, a large enough tract of land upon which to support a family. Under the most favorable conditions and with the lightest clearing ground, the cheapest rate at which logged-off land can be prepared for the plow is \$50 per acre and the maximum is about \$150 per acre. The method of clearing by donkey engine in connection with blasting, char-pitting, and burning seems to be the cheapest, most efficient, and most serviceable method, especially when the work is done on a large scale.

Highway engineering, A. H. BLANCHARD and H. B. DROWNE (*New York and London, 1911, 1. ed., pp. X+299*).—This volume gives a large mass of information relative to the construction and maintenance of roads and pavements, as presented at the Second International Road Congress, held at Brussels, 1910.

Science in the service of highway construction, C. RICHARDSON (*Pop. Sci. Mo.*, 80 (1912), No. 4, pp. 326-337, fig. 1).—The author outlines the development of modern methods of highway construction and shows how science has aided therein.

Good roads, E. J. WATSON (*Ann. Rpt. Comr. Agr., Com. and Indus. S. C.*, 8 (1911), pp. 121-127, pls. 2, fig. 1).—This report deals with the development of road construction, maintenance, and administration in South Carolina, and gives tabulated data on the total mileage of public roads in the State, the methods of construction and improvement, and the expenditures in money and labor.

Proceedings of the second annual convention of the Inter-Mountain Good Roads Association, Pocatello, Idaho, June 22-24, 1911 (*Proc. Inter-Mountain Good Roads Assoc.*, 2 (1911), pp. 64).—These proceedings contain discussions of road construction, maintenance, and administration in general, and reports of road work done in the different States belonging to this association.

Report of the State Highway Commission of Minnesota, 1909-10 (*Rpt. Highway Com. Minn.*, 1909-10, pp. 31, figs. 11).—This report presents general investigations of road conditions, building materials and construction and maintenance methods, and includes the state engineer's report on the roads of the State.

French experiments with tarred roads, W. H. HUNT (*Daily Cons. and Trade Rpts.* [U. S.], 15 (1912), No. 103, p. 430).—Attention is called to the extent of tarred roads in France, the essentials of good construction, and the results of experiments with the dust from tarred roads, divers tar and oil emulsions, and deliquescent salts used in road surfaces.

Highway bridges and culverts, C. H. HOYT and W. H. BURN (*U. S. Dept. Agr., Office Pub. Roads Bul.* 43, pp. 21, pls. 14, figs. 3).—This is a revision of Bulletin 39, previously noted (*E. S. R.*, 25, p. 891), and has for its purpose the pointing out of some of the important fundamental principles that govern operations necessary to secure properly designed highway bridges and culverts, together with some facts relating to their construction. A systematic course of procedure in bridge and culvert work is outlined and discussed, as consisting of the following steps: Securing the services of a capable bridge engineer, testing the foundation to determine its suitability, bearing power, and economy, determining the location and making the profile, determining the proper loading, and the making of accurate and economic designs and plans and cost estimates.

Plans showing details of structures are also given.

Culvert practice in road building in connection with drainage ditching in Minnesota (*Engin. and Contract.*, 37 (1912), No. 17, pp. 476, 477, fig. 1).—Specifications are given for corrugated metal culverts which are put into roads made by using the spoil banks from drainage ditches.

A plan for a small dairy house, E. KELLY and K. E. PARKS (*U. S. Dept. Agr., Bur. Anim. Indus. Circ.* 195, pp. 5, figs. 4).—This contains plans and details for constructing an inexpensive but sanitary dairy house.

The ventilation of stock stables, F. ULRICH (*Illus. Landw. Ztg.*, 32 (1912), No. 27, pp. 257, 258).—The construction of cow stalls relative to ventilation is discussed, the principal method of ventilation dealt with being that by vapor chimneys.

The development of agricultural machinery in Germany, G. FISCHER ET AL. (*Arb. Deut. Landw. Gesell.*, 1910, No. 177, pp. VIII+436, figs. 325).—This publication deals with the general development of agricultural machinery in Germany, describing and discussing ground-breaking implements, seeders, and cultivators, harvesters, cleaning and sorting machines, feed-preparing machines.

thrashers, hay balers, dairy machinery, farm engines, electricity in agriculture, and pumps.

Wood used in construction of agricultural implements, F. N. G. KRAMCH (*Farm Implements*, 26 (1912), No. 3, pp. 21, 22, 24).—This article deals with the importance of wood in the construction of agricultural machinery, describing the important wooden parts of different implements, and discussing the relative merits of different kinds of woods when used in the construction of parts of various machines.

The hand-winch stump and tree puller (*Agr. Gaz. N. S. Wales*, 23 (1912), No. 1, p. 80).—This machine has a small winding drum about 1 ft. in diameter, worked with an 8-ft. lever pulled by 2 men. A grab disposes of slack rope and a snatch block doubles the direct drum power, making it equal to about 24 tons. The power is transmitted to a flexible wire rope, one end of which is anchored to the butt of a standing tree, and the other looped around the tree to be pulled, about 10 ft. from the ground. In trials recently conducted at the Grafton experiment station, New South Wales, a swamp mahogany tree 2 ft. 9 in. in diameter was pulled out by the roots in 22 minutes.

Motor cultivation on a farm, H. SAGNIER (*Jour. Agr. Prat.*, n. ser., 23 (1912), No. 13, pp. 401, 402).—The operation and cost of operation of an internal combustion motor plow on a farm is discussed.

Examination of a seeding machine for garden or nursery planting, C. FRIEWIRTH (*Wiener Landw. Ztg.*, 62 (1912), No. 23, p. 285, fig. 1).—A machine is described which is adapted to planting seeds in gardens, nurseries, or experimental plots. It is so constructed as to plant the seeds in rows at the required depth and distance apart, and is intended as a time- and labor-saving apparatus to be used where especial care in planting is required.

Potato-digging machines, G. SEYMOUR (*Jour. Dept. Agr. Victoria*, 10 (1912), No. 2, pp. 119-122, figs. 4).—The construction and operation of several types of potato-digging machines are described.

A wagon for carrying heavy loads (*Masch. Ztg.*, 10 (1912), No. 7, p. 82, figs. 2).—A wagon is described which is especially adapted to carrying hogs or cattle or other heavy loads. It is so constructed that the bed can be raised or lowered on a steel frame, thus facilitating the processes of loading or unloading.

New ideas in modern straw balers, FABRICIUS (*Masch. Ztg.*, 10 (1912), No. 7, pp. 80-82, figs. 3).—An improved straw baler, some of its accessories, and its operation are described.

## RURAL ECONOMICS.

Agricultural credit and cooperation in England and Wales (*Jour. Bd. Agr. [London]*, 19 (1912), No. 1, pp. 43-50).—Observations are made showing that although agricultural cooperation has not been established to a very large extent in England and Wales, it has in recent years made marked development in the way of cooperative credit, insurance, purchase, production, sales, etc. The state has contributed to the movement by passing legislation making it possible for the societies to be established and registered at small cost, empowering county councils to aid such societies by money grants or guaranties, and providing funds, through the Agricultural Organization Society, for the propagation of cooperative ideas, the encouragement of new societies, and the combination of individual societies into larger cooperative unions.

Attention is called to the most common form of the small holdings and allotment societies, in which a number of intending small-holders form themselves into a society, which in its corporate capacity negotiates for the hire or pur-

chase of land and makes itself the responsible hirer or purchaser of sufficient land to meet the needs of all of its members. The society performs other functions, as the purchase of seed, manures, implements, and other requirements of members, and collects, prepares, and markets their surplus produce. In 1909 there were 146 such societies, with a membership of 7,925.

**Cooperative societies** (*Rpt. Indus. and Agr. Coop. Soc. United Kingdom, 1912, pp. LV+273, pls. 5*).—An official report presenting notes and statistics relating to industrial and agricultural cooperative societies in the United Kingdom from 1900 to 1910. The agricultural societies are grouped into 3 main classes, viz, purchase and sales societies, productive societies, and small holdings and allotment societies. "Between 1895 and 1909 the agricultural cooperative societies of all kinds making returns increased from 58 (46 for production and 12 for distribution) for the whole of the United Kingdom, to 653 (317 for production and 336 for distribution), while their combined sales increased from £354,379 to £3,609,172."

**Agricultural purchase societies in Italy up to 1910** (*Fed. Ital. Consorzi Agr. Piacenza, 2 (1911), pp. XII+505, figs. 149*).—This book presents notes, tables, maps, charts, etc., showing the work done by the Italian Federation of Agricultural Societies from 1892 to 1910 inclusive. It also includes a summary of the information furnished by 420 of the agricultural societies concerning the economic status of the various localities, together with data showing the numerical relations between the purchase societies, the rural population, and the cultivated area, as well as data on the general consumption of commercial fertilizers and the amount provided through cooperative societies.

The importance of the collective purchase societies is partially brought out in the following table:

*Progress of the Italian Federation of Agricultural Societies from 1893 to December 31, 1910.*

Year.	Members.		Capital.	Value of goods delivered to members.	Net profits.	Distribution of net profits.			
	Agricultural societies.	Individuals.				Shareholders.	Purchasers.	Employees.	Reserve fund.
			<i>Lire.</i>	<i>Lire.</i>	<i>Lire.</i>	<i>Lire.</i>	<i>Lire.</i>	<i>Lire.</i>	<i>Lire.</i>
1893....	65	207	12,885	711,147	11,009	665	3,458	864	3,948
1895....	94	264	24,804	810,435	7,463	1,143	2,378	594	2,751
1897....	115	296	38,327	2,118,629	15,109	1,087	4,547	1,136	5,202
1900....	221	348	79,681	3,806,789	1,027	886	35	8	57
1902....	300	377	95,692	3,922,159	19,995	698	7,202	1,800	8,202
1905....	460	472	144,110	9,389,183	23,239	1,154	8,370	2,092	9,621
1908....	565	499	180,159	15,686,158	22,603	2,557	7,566	1,891	8,696
1910....	618	522	216,572	13,448,499	23,147	4,039	7,180	1,795	8,337

The importance of the national insurance law as related to agriculture, SCHUMACHER (*Deut. Landw. Presse, 38 (1911), Nos. 96, pp. 1089, 1090; 97, pp. 1105, 1106; 99, pp. 1130-1132; 100, pp. 1141-1143; 101, pp. 1156, 1157; 102, p. 1168*).—This is a series of articles discussing in detail the national insurance law in Germany in its application to agriculture.

An argument for the short-time lease, E. ELLIOT (*Iowa Agr., 12 (1912), No. 5, pp. 19, 20*).—This article illustrates by concrete examples the economic advantages of short-time as contrasted with long-time leases, pointing out that the short-time lease tends toward friendly relations between landlord and tenant. The landlord can also specify each year just what fields may be plowed up and what ones must be seeded down, thus maintaining the productivity of the soil and insuring a more permanent agriculture.

**Prosperity on a rented farm in Iowa**, R. NICHOLSON (*World's Work*, 23 (1912), No. 6, p. 718).—This article presents the experience of a landowner in Iowa who sold his 320-acre farm in 1908 at \$90 per acre, and leased back 240 acres of it for 5 years. The results were very satisfactory. The net profit, in addition to the interest on the money received for the sale of land, in 1910 was \$1,677.60 and promised to be larger in 1911.

**Profitableness of agriculture in Argentina**, PFANNENSCHMIDT (*Ztschr. Agrarpolitik*, 10 (1912), No. 4, pp. 126-143).—This article presents notes and statistics showing the cost of each factor entering into the production of wheat, flax, oats, and other crops on different kinds of land in Argentina, especially the relative value of efficient labor.

The cost of breaking and preparing new land and seeding it to wheat with the more efficient labor and paying for insurance against hail is estimated at 17.6 pesos per hectare (about \$6.83 per acre), and with less efficient labor 26.75 pesos. On old land the cost with the more efficient labor is 10.3 pesos per hectare and with less efficient labor 17.85 pesos. The cost of harvesting on both old and new land with the more efficient labor is 9.75 pesos per hectare, and with the less efficient labor 15.25 pesos. The total cost per hectare on new land that will produce 5 quintals per hectare is 38.35 pesos with the more efficient labor, and on old land 31.05 pesos; on new land with less efficient labor 53 pesos, and on old land 44.1 pesos.

Corresponding data are given for other crops and wheat on other grades of land. A bibliography is also included.

**High cost of living and agriculture in France**, M. LAIR (*Rev. Écon. Internat.*, 9 (1912), I, No. 3, pp. 496-529).—This article presents the results of a rather comprehensive research, in which it discusses and illustrates under the following headings a number of causes affecting the cost of living and its relation to agriculture in France: The French market; recent rise of the chief products; identical movement of the custom duties; French agriculture as a national industry; progress of the production; tendency of France to provide for itself; decrease of the agricultural population and scarcity of workmen; difficulties in the use of mechanical and industrial processes; effect of social and fiscal laws on the increasing prices; influence of speculation; and administrative influences.

**Agriculture in Egypt**, B. O. COWAN (*Breeder's Gaz.*, 61 (1912), No. 17, pp. 988, 989).—This is a popular article describing at length the agricultural possibilities of Egypt, together with its drawbacks, due to the ancient agricultural methods still practiced by the Egyptian farmers.

**[Agricultural] production** (*So. Aust. Statist. Reg.*, 1910, pt. 3, pp. 1-148).—This is a statistical register showing the area and distribution of holdings in South Australia in 1910 to be as follows: Total area, 105,686,504 acres; occupied by owners, 7,266,867 acres; occupied by tenants, 874,119 acres; lands held under agreement to purchase from the crown, 2,461,412 acres; crown lands leased, 95,084,106 acres; total area under crops, 2,746,334 acres; under permanent artificially sown grasses, 26,416 acres; previously cropped land lying idle during the season, 2,192,478 acres; new ground cleared during the season, 369,150 acres; land in fallow, 1,369,242 acres; and balance of the holdings, 98,982,524 acres. Persons employed or who regularly assist in farm work are classified as follows: General farming, 34,251 males and 5,398 females; dairying, 1,602 males and 10,186 females; and pastoral, 5,166 males and 891 females.

Other statistics are given showing the area under each crop, the produce thereof for a period of years and the average market price, the number, description, and value of live stock, live stock products, etc.



**Agricultural statistics** (*Statist. Abs. Prin. and Other For. Countries* [Gt. Brit.], 37 (1899-1910), pp. 310-331).—A statistical abstract showing the acreage under crops, yields, number of live stock, etc., in each year from 1899 to 1910 in the following countries: Russia, Norway, Sweden, Denmark, Germany, Netherlands, Belgium, France, Spain, Italy, Austria, Hungary, Bulgaria, Roumania, Algeria, Argentina, Uruguay, Japan, Great Britain, and the United States.

**Foreign crops, March, 1912**, C. M. DAUGHERTY (*U. S. Dept. Agr., Bur. Statist. Circ.* 30, pp. 12).—Notes and statistics showing area, production, exports, and price of the principal agricultural crops and livestock in Argentina for a number of years are here presented. Wheat being the principal crop, it is of interest to note that the area has increased from 2,970,656 acres in 1890-91 to 17,037,545 acres in 1911-12, and the yield from 31,048,117 bu. to 170,562,553 bu. The other leading crops are alfalfa, corn, and flaxseed. Argentina being the principal producer of flaxseed.

### AGRICULTURAL EDUCATION.

**Education for agriculture**, F. B. MUMFORD (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 40 (1912), No. 129, pp. 19, 20).—This article emphasizes the importance of those types of education which demonstrate their efficiency in training men and women for the social, economic, and political duties of the rural communities and the State at large. It further notes that the opportunity for giving such training in schools teaching agriculture is demonstrated by the increasing demand for farm managers, teachers, investigators, various agricultural experts, and other men and women who are to be in a position to make large contributions toward the solution of these problems.

**The country school**, H. W. FOHRT (*Ann. Amer. Acad. Polit. and Soc. Sci.*, 40 (1912), No. 129, pp. 149-157).—In discussing the vitalizing influence of the ideal country school as a factor entering into the socialization of the new rural life, and as the form of education which is to reflect the daily life and interests of the rural community, the author points out that such a school must give expression to at least two things: (1) Good scientific farming, rendering ample returns for the labor expended, and (2) a rural social life satisfactory to those living in it. It must further require at least three things of the teacher: (1) He must be strong enough to establish himself as a leader in the community where he lives and labors; (2) he must have a good grasp on the organization and management of the new kind of farm schools; and (3) he must show expert ability in dealing with the redirected school curriculum.

Referring to the charges frequently made against the rural school, that it has drawn too much of its substance from sources foreign to rural needs, and that it has failed in other ways to keep pace with the demands of our rapidly developing agricultural life, the author suggests that, in order to check this tendency and so redirect the work that the rural school may become rooted to the soil in such a way as to become the chief agency in the social and economic reconstruction of rural life, there be: (1) A thorough redirection of the subject matter taught in the schools; (2) a general reorganization of the entire working staff of administrators, supervisors, and instructors; and (3) the rebuilding in many instances of the entire school plant.

**Rules, regulations, and laws relating to high and graded schools** (*Min. [Dept. Pub. Instr.] Bul.* 35, 1912, pp. 50+3).—This bulletin includes, among others, rules of the department applying to high and graded schools maintaining departments of agriculture and home economics or manual training, laws relating to the teaching of agricultural and industrial work, required equipment, etc.

**Teachers' extension schools, G. A. BRICKER** (*School Rev.*, 20 (1912), No. 4, pp. 266-270).—The author points out that federal funds derived from the Nelson Amendment are available in each State for conducting teachers' extension schools in agricultural education through the initiative of the land-grant colleges, and gives an account of the organization and management of 3 such which were established in Ohio, at Circleville on October 28, 1911, and at Mt. Vernon and Van Wert on January 13 and 20, 1912, according to a plan which he is working out experimentally under the auspices of the College of Education of the Ohio State University.

**The Scottish system of continuation schools, E. G. COOLEY** (*Vocational Ed.*, 1 (1912), No. 4, pp. 225-242).—In this article the author gives an account of the system of continuation schools in Scotland, including the plan of continuation schools in Edinburgh. In this there are (1) classes for the completion of general elementary education, including instruction in needlework, cookery, laundering, dressmaking, and millinery; (2) classes for elementary instruction in special subjects, among which are horticulture and any industry the scientific principles underlying which admit of systematic exposition, and handwork including cookery, laundering, and dairy work; and (3) organized courses of systematic instruction to fit students for the practice of particular crafts, industries, or occupations approved by the department of education, among which courses is one in agriculture and rural industries.

**The "Landwirtschaftliche Institut" of the University of Halle, Germany, H. C. PRICE** (*Agr. Student*, 18 (1912), No. 8, pp. 464-466, figs. 2).—A brief account is given of the organization and equipment of the agricultural institute of the University of Halle, which is especially notable because it was the first institute of its kind established in a university (in 1862), and also because it has the largest number of students (366 last year and 381 this year) of any of the agricultural institutes of the German universities. The subject of agriculture is divided into 3 main divisions, (1) agronomy, (2) animal husbandry and dairying, and (3) farm management. All other subjects are made secondary or given as independent courses by special lecturers as in the case of horticulture. This is given by the director of the Province Fruit Experiment Station, which is entirely separate from the university but located near Halle. The work consists principally of lectures. Class rolls and examinations are entirely lacking except that a student must be examined when he wants a teacher's certificate, a diploma, or a doctor's degree.

**Reports on agricultural and housekeeping schools for 1910-11** (*Aarsber. Offentl. Foranst. Landbr. Fremme*, 1911, II, pp. 280).—Brief accounts are given of the agricultural schools and housekeeping schools in Norway.

**Agricultural nature study, C. F. PALMER** (*Addresses and Proc. Nat. Ed. Assoc.*, 49 (1911), pp. 1118-1126).—An address before the National Education Association, San Francisco, Cal., July 8-14, 1911, in which the author discusses the importance of instruction in agricultural nature study and outlines the general scope of such work, showing particular phases of the work best adapted to different school grades. The greatest drawback is pointed out as the lack of properly trained teachers and the lack of understanding of the mutual relationship between the biological and physical sciences. He notes how this difficulty is being overcome in many places by special and summer courses on the subject in normal schools and agricultural colleges.

**First annual report of the School Garden Association of America** (*Ann. Rpt. School Garden Assoc. America*, 1 (1912), pp. 32, figs. 12).—This includes reports of the officers and proceedings and other data.

**Kentucky Arbor and Bird Day, 1911, ETHEL REID** (*Frankfort, Ky.: Dept. Ed.*, 1911, pp. 140, pls. 10, figs. 18).—This compilation consists of a history of

Arbor Day and Bird Day, suggestions for teachers and pupils, programs, and lessons, poems, and music on trees, flowers, and birds.

Report of committee on courses of study in agriculture, E. C. BISHOP (*Addresses and Proc. Nat. Ed. Assoc.*, 49 (1911), pp. 1138-1152).—This report, submitted to the National Education Association, San Francisco, Cal., July 8-14, 1911, makes general inquiries into the scope of agricultural education and its relation to present-day principles in education, and presents suggestions as to specific courses in agriculture, the governing influences in the arrangement of such courses, and the pedagogical procedure in organizing the subject in schools maintaining the usual general public school courses of study. In addition to an outline of the work as pursued in a few of the States, a summary of successful practices in teaching agriculture in the rural school with one teacher is presented.

Spring laboratory methods, S. A. MINEAR (*Bul. Okla. Agr. and Mech. Col.*, 8 (1912), No. 26, pp. 8, figs. 9).—Laboratory exercises (1) to increase the production of corn by judicious selection of seed ears, (2) the determination of good cotton seed for planting purposes, (3) a practical study of the yield of oats, (4) to demonstrate how plants feed, (5) the amount of moisture, and (6) the loss of moisture after rains, are outlined by the author.

Potato studies for schools, J. W. HUNGATE (*Dept. Agr. Stat. Normal School [Cheney, Wash.]*, *Bul. A*, No. 2, 1912, pp. 15, figs. 5).—This pamphlet gives instructions as to planting, cultivating, and harvesting the potato crop, including exercises on the structure, albumin, and water content of the potato, its use for seed planting operations, treatment for scab, seed selection, storing, and scoring potatoes.

#### MISCELLANEOUS.

Annual Reports of the Department of Agriculture, 1911 (*U. S. Dept. Agr. Rpts. 1911*, pp. 1019).—This consists of the report of the Secretary and heads of Bureaus. The various reports are also issued as separates. A portion of the report of the Secretary, comprising a discussion of the economic results of cold storage, is abstracted on page 164 of this issue.

Twenty-seventh Annual Report of the Bureau of Animal Industry, 1910 (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt. 1910*, pp. 573, pls. 42, figs. 75).—This contains a report of the Chief of the Bureau for the fiscal year ended June 30, 1910, numerous articles abstracted elsewhere in this issue, and a list of the publications of the Bureau during 1910. An appendix contains the rules and regulations of the Secretary of Agriculture relating to animal industry issued during 1910.

Annual Report of Hawaii Station, 1911 (*Hawaii Sta. Rpt. 1911*, pp. 63, pls. 7, figs. 6).—This contains the organization list, a summary by the special agent in charge as to the investigations of the year, and reports by the entomologist, horticulturist, chemist, and agronomist. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Twenty-fourth Annual Report of Michigan Station, 1911 (*Michigan Sta. Rpt. 1911*, pp. 147-510, pls. 2, figs. 51).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are abstracted elsewhere in this issue, reprints of Bulletins 262 to 264, Special Bulletin 54, Technical Bulletins 5 to 10, and Circulars 10 and 11, previously noted, and a financial statement for the fiscal year ended June 30, 1911.

## NOTES.

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**California University and Station.**—Dean T. F. Hunt, of the Pennsylvania College and Station, has been appointed to succeed Dean Wickson as dean and director. Recent appointments as instructors include James Koeber in farm mechanics, William H. Arnold in chemistry and botany, W. F. Gericke and Paul S. Burgess in soils, and Ralph H. Taylor in horticulture. W. B. Herms has been promoted to the assistant professorship of applied parasitology, and W. G. Hummel to the assistant professorship of agricultural education.

An additional substation was opened May 25 at Meloland in Imperial County, where a tract of about 40 acres has been secured and buildings and water supply provided. Attention is to be given to demonstration work with fruits, grains, forage plants, cotton, and other crops. Walter H. Packard will be in charge of the substation.

**Iowa College and Station.**—W. J. Kennedy, former head of the animal husbandry department, has been appointed superintendent of agricultural extension, vice P. G. Holden, resigned, and will be succeeded by W. H. Pew. A. V. Storm, head of the department of agricultural education, has resigned to accept a similar position at the University of Minnesota. Nelson C. Brown, assistant professor of forestry, has resigned to become assistant professor of forest utilization in the New York State School of Forestry at Syracuse University.

Other resignations include M. L. King, experimentalist in agricultural engineering, and in the extension division A. H. Snyder, Muri McDonald, G. R. Bliss, and A. A. Burger. Robert Snyder and E. H. Kellogg have been appointed assistants in soils in connection with the position made vacant by the resignation of A. A. Wells.

A school of silo construction was held at the college June 3 to 7, with an attendance of about 60.

**Kansas College and Station.**—W. A. Cochel, of the Pennsylvania College and Station, has accepted the position of animal husbandman, beginning July 1.

**Louisiana Stations.**—The general assembly appropriated \$50,000 at its recent session for the support of the agricultural schools of the State, an increase of \$25,000 over last year. An appropriation of \$3,000 for the repair of the sugar house at the Audubon Park Station was also granted.

A tract of 60 acres has been purchased for the use of the station at Baton Rouge adjacent to its present holdings.

The agricultural demonstration train has completed a trip of 4,625 miles over 15 different railroads, attracting an estimated attendance of 142,885.

E. J. Watson, horticulturist at the Calhoun Station, has resigned to take effect August 1.

**Massachusetts College and Station.**—An offer of \$150 yearly for three years has been made by F. Lothrop Ames for prizes to the three men doing the best work in live stock judging. The fund will be utilized in defraying the expenses of competition in the live stock judging contests at the National Dairy Show.

Frank F. Moon, associate professor of forestry, has resigned to become professor of forest engineering at the New York State College of Forestry at Syracuse University. Dr. Ernest Anderson, research instructor in chemistry at the University of Chicago, has been appointed assistant professor of general and physical chemistry.

In the station, Director W. P. Brooks has been granted leave of absence, and Vice Director J. B. Lindsey is temporarily in charge. Herbert J. Baker, secretary to the director, resigned July 1. C. L. Beals and Howard A. Turner, 1912 graduates of the college, received appointments July 1, the former as assistant chemist in the fertilizer section, and the latter as graduate assistant in horticulture.

**Minnesota University and Station.**—A new building, 168 by 169 feet, is under construction for the department of agricultural engineering, and it is hoped to complete at least the portion devoted to shop work early in 1913. A girls' dormitory, costing \$50,000, has recently been completed at Morris, and a similar dormitory for boys is to be begun in the near future. A science building, costing \$40,000, is nearing completion at Crookston.

W. A. McKerrow has been appointed specialist in animal husbandry in the extension division, with the rank of assistant professor, to succeed W. H. Tomhave, who has accepted the position of animal husbandman at the Pennsylvania College and Station.

**Mississippi College and Station.**—G. R. Hightower succeeded J. C. Hardy as president of the college July 1. R. L. Shields has resigned as professor of animal husbandry to become professor of animal husbandry and dairying at Clemson College and Station, and was succeeded by Archibald Smith September 1. Other appointments include J. K. Morrison as college and station poultryman, Dr. C. F. Briscoe as station bacteriologist, and Dr. J. C. Robert as dean of the school of agriculture and professor of agronomy.

**Nebraska University and Station.**—O. L. Sponsler, in charge of the forestry work, has resigned to accept the position of junior professor of silviculture in the University of Michigan. R. F. Howard, assistant professor of horticulture and assistant horticulturist, has resigned to accept a similar position in the University of Wisconsin, beginning September 1.

**New Hampshire College and Station.**—T. R. Arkell, associate professor of animal husbandry and animal husbandman, has resigned to accept a position with the Canadian Department of Agriculture as head of the sheep division. He will investigate for the present sheep breeding and the wool industry in Manitoba, Saskatchewan, and Alberta.

**Cornell University.**—The recent appropriations of the legislature authorize the construction of a \$100,000 forestry wing of the proposed plant industry building, a \$91,000 animal husbandry laboratory building, a \$38,000 live stock judging pavilion, and a \$100,000 extension to the agronomy wing of the present main building. In addition, \$265,000 was granted for current expenses of the college of agriculture, \$50,000 for extension work, \$30,000 for equipping the home economics building, \$15,000 for equipping the poultry husbandry building, \$4,000 for the summer school, \$20,000 for additional instruction in physics and chemistry, \$20,000 for various additions, grading and improvement of grounds, and \$2,000 for investigations of the diseases of the gladioli and other bulbous plants. Excavations are under way for the new agricultural auditorium building, which will be perhaps the most imposing building of the university and will serve as a connecting architectural link between the agricultural group and the main campus. It will be one of the largest auditoriums in western New York, seating over 2,500 people, besides affording additional facilities for class rooms and laboratories. The contract calls for its completion November 1.

Samuel N. Spring, state forester of Connecticut, has been appointed professor of forestry. Other appointments include the following: As instructors, M. J. Prucha and G. R. Hill, jr., in plant physiology, Charles Gregory and C. P. Smith in plant pathology, H. O. Buckman in soil technology, C. E. Ladd in farm management, H. M. Pickrill and T. J. McInerney in dairy industry, Clara Brown in home economics, E. M. Tuttle in rural education, and Royal Gilkey in extension teaching; and as assistants, J. T. Francis, Charles Chubb, and L. M. Massey in plant pathology, T. E. Schreiner in poultry husbandry, and E. D. Montillon in rural art.

**North Carolina College Station.**—Guy W. Wilson has resigned as assistant in plant diseases to take up graduate work at Columbia University.

**Ohio State University.**—A course in plant genetics is to be offered for the first time next year. F. R. Marshall has accepted a position as head of the animal husbandry department of the California University and Station.

**Pennsylvania Institute of Animal Nutrition.**—Director H. P. Armsby has been elected a foreign member of the Royal Academy of Agriculture of Sweden.

**Rhode Island College and Station.**—Philip H. Wessels, who was formerly assistant chemist and who has been a graduate student at the University of Wisconsin, has returned as first assistant chemist to the station. Leroy F. Whipple has resigned as assistant chemist to engage in commercial work. Frank O. Pitts, a 1912 graduate of the Massachusetts College, has been appointed assistant chemist, and George E. Merkle, also a graduate of the Massachusetts College, has been appointed assistant in agronomy and chemistry in the college and station.

**Clemson College and Station.**—W. L. Hutchinson, formerly director of the Mississippi Station, has been appointed to the professorship of agronomy. Recent resignations include those of J. M. Napier as assistant professor of agronomy to engage in farming; W. P. Gee as assistant professor of entomology to take up graduate work at the University of California; C. C. Vincent as associate professor of horticulture to accept a position with the University of Idaho; L. A. Niven as assistant in horticulture in the extension division to engage in horticultural journalism; and Dr. W. F. Burleigh as assistant veterinarian to engage in veterinary practice.

R. W. Simpson, a life member of the board of trustees and for over twenty years its president, died July 11 at the age of 72 years. As executor of the will of the late Thomas G. Clemson, which provided a considerable bequest for an agricultural and mechanical college in South Carolina, he was prominently identified with the establishment of the present institution.

**West Virginia University and Station.**—O. M. Johnson, of Ohio State University, has been appointed associate professor of farm management and in charge of farm management in the station, in cooperation with the Farm Management Investigations of this Department. P. B. Bennetch, of the State School of Agriculture at Canton, N. Y., has been appointed assistant professor of dairying in the university and dairyman in the station. L. M. Peairs, of the Kansas College and Station, has been appointed associate professor of entomology and entomologist, vice F. E. Brooks, resigned. K. H. Knudsen, assistant chemist, has resigned to engage in commercial work in Norway. In the department of horticulture, A. L. Dacy has been appointed associate professor of horticulture, E. C. Auchter and L. F. Sutton assistants, and A. B. Brooks, a 1912 graduate of the university, instructor in the university and assistant in the station.

The first state country life conference had a successful session July 15 to 18.

**Office of Experiment Stations.**—S. H. McCrory, connected with the field work of the Drainage Investigations of this Office since 1907, has been appointed engineer in charge of drainage work, and has entered upon his duties. J. O.

Rankin, who has been associated with the field crops section of *Experiment Station Record*, has resigned to become editor for the Minnesota University and Station.

**Seaman A. Knapp School of Country Life.**—A grant of \$250,000 by the General Education Board has been announced to the George Peabody College for Teachers, at Nashville, Tenn. This fund is to be utilized for the establishment of the Seaman A. Knapp School of Country Life, which will give special attention to the training of teachers for rural schools, and in accordance with the usual policy of the board is contingent upon the raising of an equal sum by the institution.

**Royal International Horticultural Exhibition.**—This exhibition, held in the grounds of the Royal Hospital, Chelsea, England, comprised numerous scientific exhibits from various institutions and two conferences, one on May 23 on horticultural education, and the other on May 24 on legislation in connection with insect pests. Papers were contributed to the educational conference by Dean Bailey, of Cornell University, on Horticultural Education in America; K. Weinhausen, of Berlin, on Horticultural Education in Germany; Prof. A. Buyssems, of the School of Horticulture at Vilvorde, on Horticultural Education in Belgium; and W. Hales on the Education of a Gardener. The value of importation regulations as a means of preventing the introduction of plant pests was discussed by Prof. L. Ritzema Bos, of Holland. A. G. L. Rogers considered the aim of legislation in Great Britain, and A. W. Sutton discussed import dues and regulations. Legislation in connection with insect pests was discussed by H. Maxwell-Lefroy, of India, and that for fungus diseases by H. T. Güssow, botanist for the Canadian Department of Agriculture.

Hon. Walter Runciman, president of the Board of Agriculture and Fisheries, gave an address in which he announced the establishment of a new division of the board for exclusive attention to horticultural interests. A. G. L. Rogers has been appointed head of the division, and is to be assisted by an entomological expert, eight other experts, and a clerical staff.

**Prospective Agricultural Meetings.**—Announcement is made of the seventh International Dry Farming Congress, which will meet at Lethbridge, Alberta, October 21 to 26. The twentieth annual Irrigation Congress will be held at Salt Lake City, Utah, September 30 to October 8. The American Breeders' Association will meet at Columbia, S. C., January 24 to 27, 1913, in connection with the fifth National Corn Exposition.

**Miscellaneous.**—The Franklin Institute of Philadelphia has awarded to Dr. Oswald Schreiner and Elbert C. Lathrop, of the Bureau of Soils of this Department, the Edward Longstreth medal of merit for a paper entitled *The Distribution of Organic Constituents in Soils*, which appeared in the August, 1911, issue of the *Journal of the Franklin Institute*.

Dr. E. J. Russell has been appointed director of the Rothamsted Station, in succession to A. D. Hall, whose resignation has been previously noted.

William R. Smith, for sixty years superintendent of the National Botanic Gardens, died at Washington, D. C., July 7, at the age of 84 years.

The death is noted of Dr. Ernst Schulze, professor of agricultural chemistry at the Zurich Technological Institute, at the age of 72 years.

